Symmetra™

User's Manual

SYMINIF
SYMINIF-PD
SYMSTRF
SYMSTRF-PD

APC

www.apcc.com

Important Safety Instructions!

Please read this manual!
Veuillez lire ce manuel!
Bitte lesen Sie dieses Anleitungshandbuch!
¡Se ruega leer este manual de instrucciones!

This *User's Manual* provides safety, installation and operating instructions that will help you derive the fullest performance and service life that the Symmetra™ Power Array has to offer.

PLEASE SAVE THIS *USER'S MANUAL!* It includes important instructions for the safe use of the Symmetra™ Power Array, and for obtaining factory service should the proper operation of the system or the components come into question. Service or storage issues may arise at a later date, and may require reference to this *User's Manual*, or to the technical support information that is included in it.

CONSERVER CES INSTRUCTIONS! Cette notice contient des instructions importantes concernant la sécurité.

Radio Frequency Interference

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules and the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Part #: 990-7770A

Revised 10/97

Limited Warranty

American Power Conversion (APC) warrants its products to be free from defects in materials and workmanship for a period of two years from the date of purchase. Its obligation under this warranty is limited to repairing or replacing, at its own sole option, any such defective products. To obtain service under warranty you must obtain a Returned Material Authorization (RMA) number from APC or an APC service center. Products must be returned to APC or an APC service center with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase. This warranty does not apply to equipment which has been damaged by accident, negligence, or mis-application or has been altered or modified in any way. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.

EXCEPT AS PROVIDED HEREIN, AMERICAN POWER CONVERSION MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

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As a general policy, American Power Conversion (APC) does not recommend the use of any of its products in life support applications where failure or malfunction of the APC product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. APC does not recommend the use of any of its products in direct patient care. APC will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to APC that (a) the risks of injury or damage have been minimized, (b) the customer assumes all such risks, and (c) the liability of American Power Conversion is adequately protected under the circumstances.

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Hospital grade wiring devices and leakage current may be ordered as options on many APC UPS systems. APC does not claim that units with this modification are certified or listed as Hospital Grade by APC or any other organization. Therefore these units do not meet the requirements for use in direct patient care.

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Table of Contents

INTRODUCTION

Theory of Operation i
Modes of Operation iii

SAFETY INFORMATION

Symbols Used In This Manual safety-1
Important Safety Instructions safety-1

1. PHYSICAL REPRESENTATION

The Power Array Frame 1-1
PowerView User Interface 1-2
Louvered Cover Grills 1-2
Power Modules 1-2
Battery Module 1-2
Main Intelligence Module (MIM) 1-3
Redundant Intelligence Module (RIM) 1-3
Input Circuit Breaker 1-3
Maintenance Bypass Switch 1-3
Rear View of Power Array 1-4
System Enable Switch 1-4
Communication Interface Ports 1-4
SmartSlot Accessory Ports 1-4
REPO/Input/Output Wiring Panels 1-4
Power Distribution Unit Panel 1-4
Battery Extension Frame Connector 1-4

2. SITE PREPARATION

Space and Weight Considerations 2-1
Transporting Power Array to Installation Site 2-1
Operating Conditions 2-1
BTU Output 2-1

3. UNPACKING AND INSTALLING FRAME

Initial Inspection 3-1
Check For Damage 3-1
Handling Considerations 3-1
Tools Required For Setup 3-1
Storage of Battery and Power Modules 3-1
Moving the Frame 3-1
Removing Packing Materials 3-2
Remove the Frame from the Pallet 3-2
Moving Battery & Power Modules 3-2
Clean-Up 3-2

4. WIRING REQUIRMENTS & PROCEDURES

Wiring Overview 4-1
Input Wiring 4-2
Output Wiring 4-4
Remote Emergency Power Off Wiring 4-7
Electrical Wiring Test/Checklist 4-8

5. SETTING UP THE POWER ARRAY

Overview of Setup 5-1
Frame Leveling Procedure 5-1
Installing Battery Modules 5-2
Installing Power Modules 5-3
Installing the Main Intelligence Module (MIM) 5-4
Installing the Redundant Intelligence Module (RIM) 5-4
Installing the PowerView Interface 5-5
SmartSlot Interface Accessories 5-6
Installation Test/Checklist 5-7

6. THE POWERVIEW DISPLAY

Overview 6-1
PowerView Functions 6-1
PowerView LED's 6-2
Navigation Keys 6-2
Startup Screen 6-3
Top level Menu Screen 6-3

7. CONFIGURING & OPERATING THE SYMMETRA

Introduction 7-1
Powering the System 7-1
Powering the Loads 7-2
Review Status Conditions 7-2
Perform a Self-Test 7-4
Shutdown Parameters 7-5
Configure Alarms 7-5
Review Diagnostics Menu 7-6
Review Logging Menu 7-6

8. MODULE REPLACEMENT

Module Failure Alarm Indicators 8-1
Technical Support and Obtaining a Replacement Module 8-1
Battery Module Replacement Procedure 8-2
Power Module Replacement Procedure 8-3
Main Intelligence Module Replacement Procedure 8-4
Redundant Intelligence Module Replacement Procedure 8-4

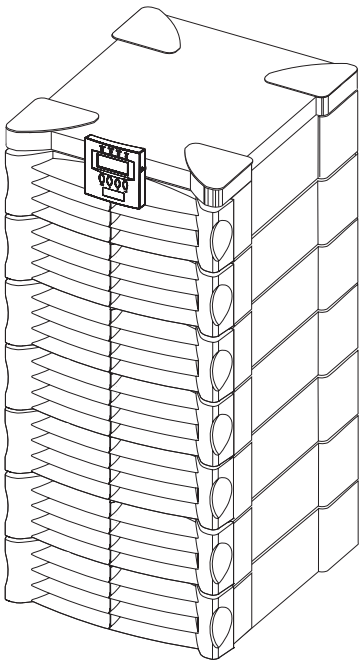
9. POWERVIEW DISPLAY MESSAGES

Start-Up Messages 9-1
General Status Messages 9-2
Module Failure Messages 9-3
Threshold Alarm Messages 9-3
Bypass Messages 9-3
General Fault Messages 9-4

INDEX

Introduction

The APC Symmetra™ Power Array is a scalable, redundant power protection system for multiple servers and business critical applications. This is an introduction to the Symmetra™ Power Array.



Thank You!

Thank you for investing in the Symmetra™ Power Array. Please read this *User's Manual* thoroughly prior to installing the system. It provides important information about installing and using the Symmetra™ safely and effectively.

Symmetra™ Overview

The Symmetra™ is a high-performance, uninterruptible power "array" system, designed for large-scale loads. It provides conditioned, reliable AC power to load equipment, and provides protection from power blackouts, brownouts, swells, sags, surges and interference. The Symmetra™ Power Array system is comprised of either a MiniFrame, or a MasterFrame, and a variable set of modules. A MiniFrame system can be configured to deliver a maximum output of 8kVA, and a MasterFrame system, a maximum of 16kVA.

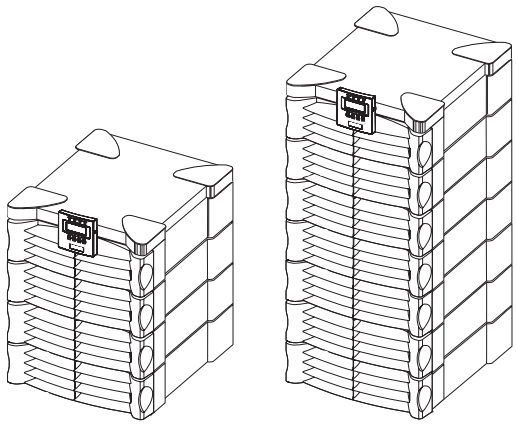


***Fig I-1** MiniFrame and MasterFrame*

Theory of Operation

The Symmetra™ Power Array is comprised of three functional components: A power processing system, a battery source, and a control/user interface system. Output power is routed through a transformer prior to delivery to the load equipment. See figure I-2. Each of the functional components and the transformer are described in the following text.

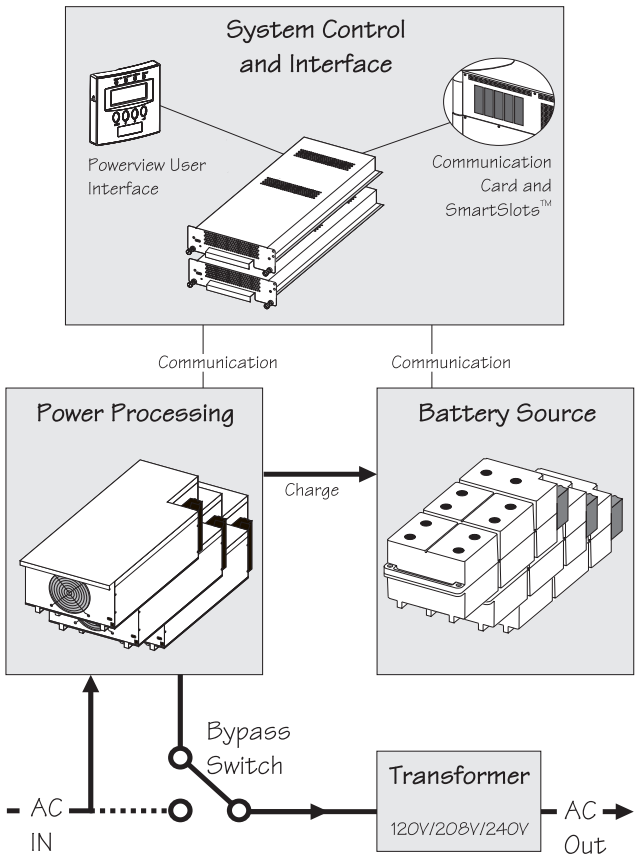


***Fig I-2** Functional Diagram of a Symmetra™*

Power Processing System

The power processing system delivers conditioned AC output power with a low distortion sinewave. Under normal operating conditions, power is received from the AC utility power source, conditioned by the power processing system, and delivered to the load equipment. In the event of an AC utility source failure, the power processing system receives power from the battery source (battery modules), converts it to conditioned AC, and delivers it to the load equipment. When AC utility power is present, the power processing system also maintains the battery source at full charge.

The power processing system in Symmetra™ is comprised of individual power module(s). Each power module contains the electronics for a complete 4kVA UPS, including the rectifier, charger and inverter. When two or more power modules are present, they operate in parallel, sharing the load equally.

By configuring the system with at least one more power module than is required to power the load (a redundant power module), Symmetra™ can sustain a power module failure, and still deliver full power to the load equipment. The failed module is identified by the control/user interface system, an alarm is initiated to notify the user of the module failure, and the hot-swappable module can be replaced by the user, without the need to power down the load equipment.

A Symmetra™ MiniFrame provides bays for up to three power modules, and a MasterFrame provides bays for up to five. This provides the full system capacity (8kVA and 16kVA respectively), plus one redundant power module.

Battery Source

The battery source is comprised of parallel, hot-swappable, 120V battery modules. These are housed in the Symmetra™ frame, and in an optional extension battery frame.

A Symmetra™ MiniFrame provides bays for up to two battery modules, and a MasterFrame provides bays for up to four. Both of these frames can be connected to an extension battery frame. Additional battery modules increase on-battery run time.

Control/User Interface

The control/user interface system coordinates the operation of the Symmetra™ and reports status conditions via several user interface options. Functions performed by the control/user interface component include module coordination and state control, analysis and reporting of system status, and reporting of alarm conditions.

Module Coordination & State Control - The Symmetra™ incorporates a main intelligence module (MIM) that continuously monitors the system, and delivers data to both the PowerView user interface, and to the communication ports. The MIM coordinates the initial power up of the system, transfers it into and out of bypass mode, transfers the power source between the utility AC power, and the battery source, and coordinates shutdown operations.

System Status Monitoring - The MIM gathers data about the system components, and delivers it to both the PowerView interface, and to the computer interface ports. System status monitoring and reporting data include the current predicted run time, the status of individual battery modules and power modules, input & output voltage, input & output voltage frequency, and the size and status of the current output load.

Alarm Condition Detection - The control/user interface system monitors the Symmetra™ for alarm conditions. If an alarm condition is detected, the PowerView user interface initiates an audible and visual alarm. Alarm conditions include on-battery, low battery, module faults, overloads, loss of redundancy and a variety of other default and user defined events. All possible alarm messages and the appropriate user responses are provided in chapter 10.

Transformer

The power processing system receives either 208V or 240V input AC utility power, and delivers 240V power to an internal transformer. The transformer delivers multiple output voltages (120V/208V/240V) to an output wiring terminal block inside the Symmetra™ frame. Output wiring procedures are provided in chapter 4.

Modes of Operation

The Power Array functions in one of four modes of operation, depending on user commands, the status of the AC utility voltage, and the condition of the Symmetra™ itself. The four modes are Load-Disconnect, On-Line, On-Battery, and By-pass. The PowerView interface reports the operating mode.

Load-Disconnect Mode

In the load-disconnect mode, incoming AC utility power is present and the system is internally powered, but no output power is delivered to the load equipment. The Symmetra™ enters the load-disconnect mode at the initial power up, when the system enable switch is switched to the "on" position. When the system is operating on-line, and the "load off" command is entered in the PowerView interface, it returns to the load-disconnect mode. Figure I-3 illustrates the power flow when the system is operating in the load-disconnect mode.

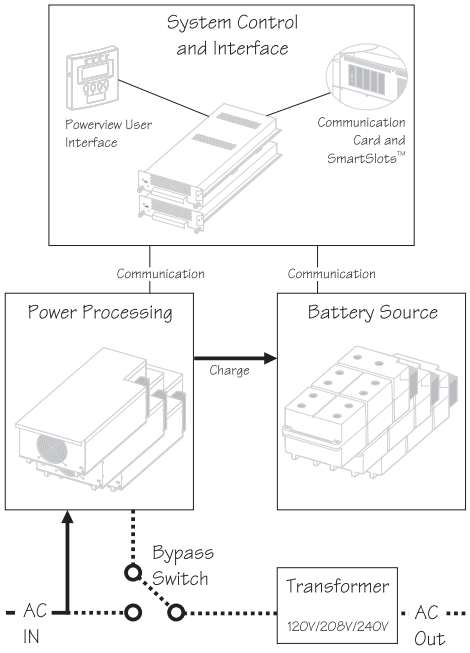


Fig I-3 Load-Disconnect Operating Mode

On-Line Operating Mode

The on-line operating mode is the "normal" operating mode. When the system is in the on-line operating mode, the Power Array receives power from the AC utility, and delivers conditioned power to the load equipment. The Power Array maintains proper battery charge, regulates the output voltage and frequency, and protects the load from surges and electrical noise. Symmetra™ will operate in this mode if it has been commanded to turn the load on, the incoming utility voltage is present and functioning properly, and there are no preventing abnormal conditions, such as an overload. See figure I-4 for a diagram of the power flow when the system is in the on-line operating mode.

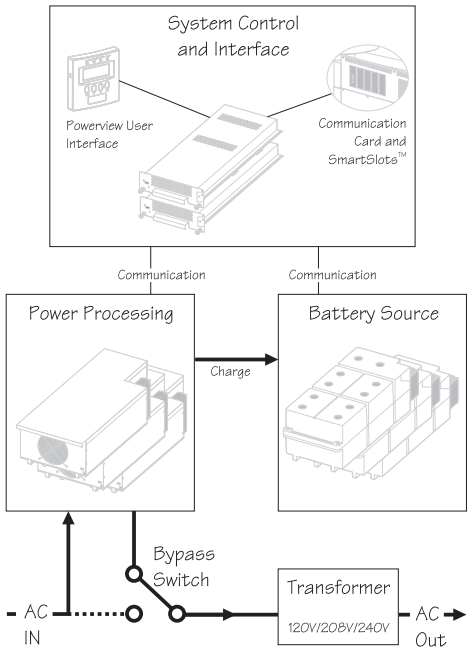


Fig I-4 On-Line Operating Mode

On-Battery Operating Mode

When in the on-battery mode, the Power Array draws DC power from the battery source, converts it to conditioned AC power that is then delivered to the load equipment. Symmetra™ typically enters this mode in the event of a utility power failure. It will also operate in the on-battery mode during a user initiated battery self test.

On-battery operation is limited in duration and is dependent upon the number of battery modules, their state of charge, and the size of the load. Symmetra™ will remain in the on-battery state until either the incoming utility power is restored, or the batteries are depleted. See figure I-5 for a diagram of the power flow when the system is in the on-battery mode.

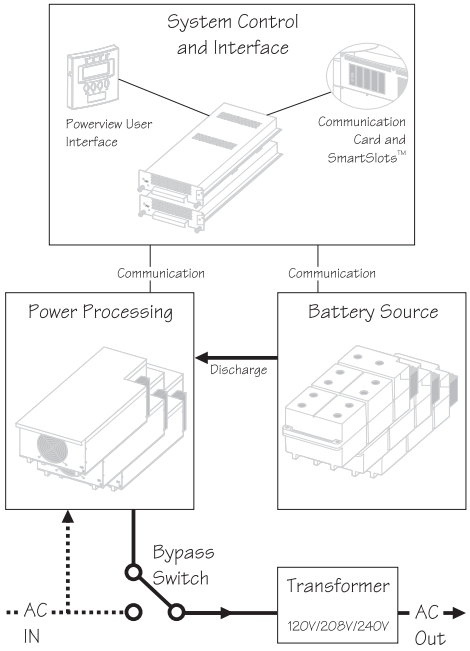


Fig I-5 On-Battery Operating Mode

Bypass Operating Mode

When the Symmetra™ is in the bypass operating mode, the system is bypassed, and utility power is delivered directly to the load. Symmetra™ is equipped with an automatic bypass function to allow the system to automatically go into bypass mode, and a manual maintenance bypass switch to allow a user to manually bypass the system. Either can be used to place the Power Array into bypass operating mode.

The Symmetra™ will automatically transfer to the bypass operating mode when AC utility power is present, but the load cannot be powered by the inverter. Events which may cause this include overloads, or failed non-redundant power modules. The Symmetra™ will automatically return to the on-line mode when the triggering event clears. Figure I-6 illustrates the power flow when the system is in the bypass mode.

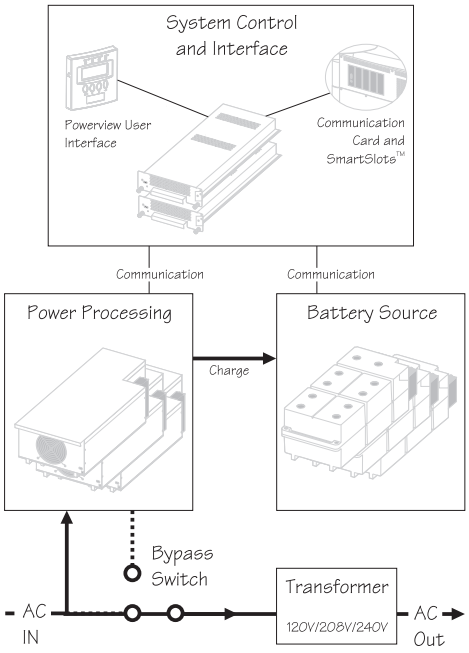


Fig I-6 Bypass Operating Mode

Definitions

The following definitions are used in this manual and will be helpful in understanding Symmetra™.

Redundancy - Indicates the presence of one or more extra modules, allowing the system to sustain a fault and continue to provide full protection to the load. To be fully redundant, the system should be configured with a redundant intelligence module, and at least one redundant power module.

Note: *The number of battery modules determines the length of the run time. While it is prudent to use the maximum number of battery modules possible, they are not considered redundant.*

N+1 Redundancy - Refers to the level of redundancy, specifically related to power modules. "N" represents the number of modules required to power the load, and "+1, +2, etc." represents the number of extra power modules that are present.

For example, a 7.3 kVA load requires two power modules for adequate protection. If the Symmetra™ is configured with only two modules, it has an "N+0," level of redundancy. (No redundancy). If the system is configured with three power modules, it has an "N+1" redundancy. Depending on the size of the load, Symmetra™ can be configured with 2, 3 or even 4 extra power modules. Respectively, it would have an N+2, N+3, or N+4 level of redundancy.

Capacity - The maximum amount of output power that a Symmetra™ system can deliver. The capacity is limited by the lesser of the frame size, or the capacity of the installed power modules.

For example, a MiniFrame (8kVA) with one power module installed (4kVA) has a system capacity of 4kVA. A MasterFrame (16kVA) with five power modules (20kVA) has a system capacity of 16kVA.

Hot-swappable - The modules are "hot-swappable" means they can be replaced safely by a user or service provider while the load is still powered and fully protected.

Important Information

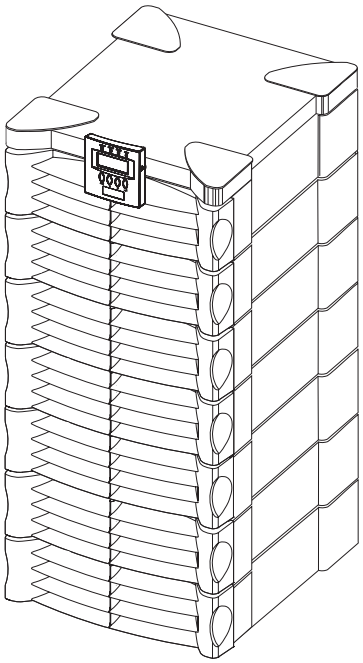
Please read this *User's Manual* thoroughly, before proceeding with the installation of the Symmetra™ Power Array system. It provides important information about installing and using the Symmetra™ safely and effectively. Pay close attention to text that is accompanied by a danger, or caution symbol. For technical support, contact APC at:

1-888-809-TECH

Safety Information

Important Safety Information

Read this safety information in its entirety,
before proceeding with the installation &
operation of the Symmetra™ Power Array.



Symbols Used In This Manual

The following symbols appear in this *User's Manual*:

CAUTION/DANGER - Caution indicates risk of bodily harm. Danger indicates that a risk of electrical shock is present and the associated procedures should be followed carefully.

"STAND BY MODE" - The system enable switch, and the input circuit breaker use the "stand by" mode. When either of these are switched to "stand by," the Power Array is disconnected from utility input voltage. In this mode, the system appears to be off, although the utility power is still connected to the system. For this reason, the standby mode is *unsafe for servicing the system.* Always follow the five step Total Power Off procedure before servicing the Power Array. (See procedure at right.)

"OFF POSITION" - The maintenance bypass switch is the only switch that can be placed in the "off" position. When switched to the "off" position, the Power Array functions normally, receiving power from the utility source, and delivering conditioned power to the load equipment.

"ON POSITION" - All three switches (The system enable switch, the maintenance bypass switch and the input circuit breaker) can be placed in the "on" position. See the description for each of these switches in chapter 1.

SAFETY EARTH GROUND - Indicates the primary safety ground.

IMPORTANT SAFETY INSTRUCTIONS

- SAVE THESE INSTRUCTIONS - This manual contains important instructions that should be followed during installation and maintenance of the Power Array, and for installation or replacement of the battery and power modules.

  CONSERVER CES INSTRUCTIONS. CETTE NOTICE CONTIENT DES INSTUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ.

- Connection to the branch circuit (mains) must be performed by a licensed electician.

- Installation of the power and battery modules can be performed by any individual with no previous technical experience.

- Operation of the equipment can be performed by any individual with no previous technical experience.

- The protective earth conductor for the Symmetra™ carries the leakage current from the load devices (computer equipment). Therefore, the size of the conductor must be at least as large as the wire required by IEC 950. IEC 950 states the following nominal cross-sectional areas:
  - 2.5 mm^2 for rated current between 17 & 25 A
  - 6 mm^2 for rated current between 33 & 40 A
  - 10 mm^2 for rated current between 41 & 63 A
  - 16 mm^2 for rated current between 64 & 80 A

- **FIVE STEP TOTAL POWER OFF PROCEDURE**
  To remove all power from the Power Array (Total Power Off), the following series of events must occur in the order listed:
  1. Set system enable switch to the "stand by" position.
  2. Set input circuit breaker to the "stand by" position.
  3. Remove all battery modules from the Power Array.
  4. Disconnect external battery cabinet (if present).
  5. Disconnect the mains/branch circuit breaker.

- **CAUTION:** Risk of Electrical Shock and Energy Hazard, 120V, 7.2 Ah battery module. Before replacing battery modules, remove conductive jewelry such as chains, wrist watches and rings. High short circuit current through conductive materials could cause severe burns.

- **CAUTION:** Do not dispose of batteries or battery modules in a fire. The batteries may explode.

- **CAUTION:** Do not open or mutilate battery modules or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.

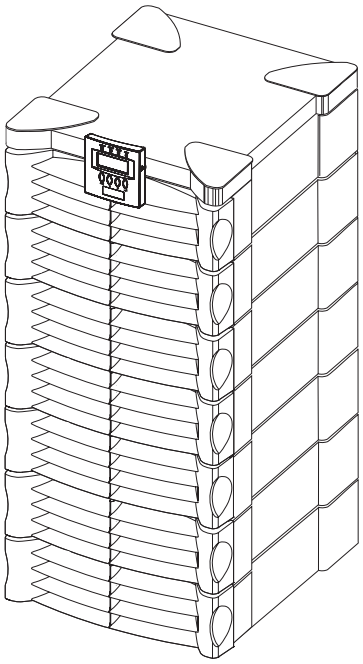
- While battery modules are user replaceable, servicing of the battery modules themselves should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

- When replacing or adding battery modules to the Power Array system, use only the "SYBATT Symmetra™ Battery Module." Contact APC for technical support, for additional, or for replacement battery modules at:

  1-888-809-TECH

Chapter One
Physical Representation

This chapter provides an illustrated description of the Symmetra™ Power Array system, and each of the modular components. Before proceeding, examine the illustration below. It depicts a MasterFrame (16kVA) Power Array as it appears during normal operating conditions. The grill covers are correctly installed, and the Powerview Interface is mounted on the frame.



The Power Array Frame

The Symmetra™ Power Array frame serves as the base for the modular components of the system. The MiniFrame provides bays for three power modules, and two battery modules. The MasterFrame provides bays for five power modules, and four battery modules. Both frames provide one bay at the top right that houses the main intelligence module (MIM) and redundant intelligence module (RIM).

The bottom of both frames contain wiring input/output access panels and terminal blocks. A system enable switch, input circuit breaker and maintenance bypass switch are also located at the bottom of the frame. The output voltage transformer is located inside the bottom of the frame. A fully loaded MiniFrame is depicted in figure 1-1. A MasterFrame with factory installed MIM and RIM, and empty power and battery module bays is depicted in figure 1-2.

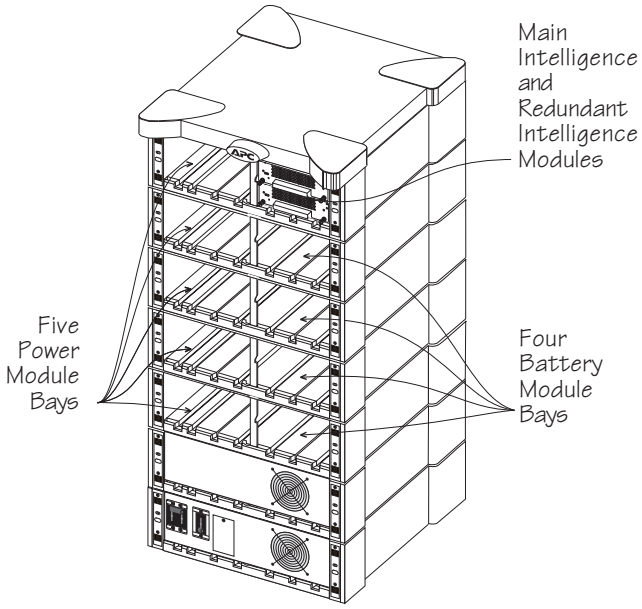


***Fig 1-2** An Empty MasterFrame (grill covers removed)*

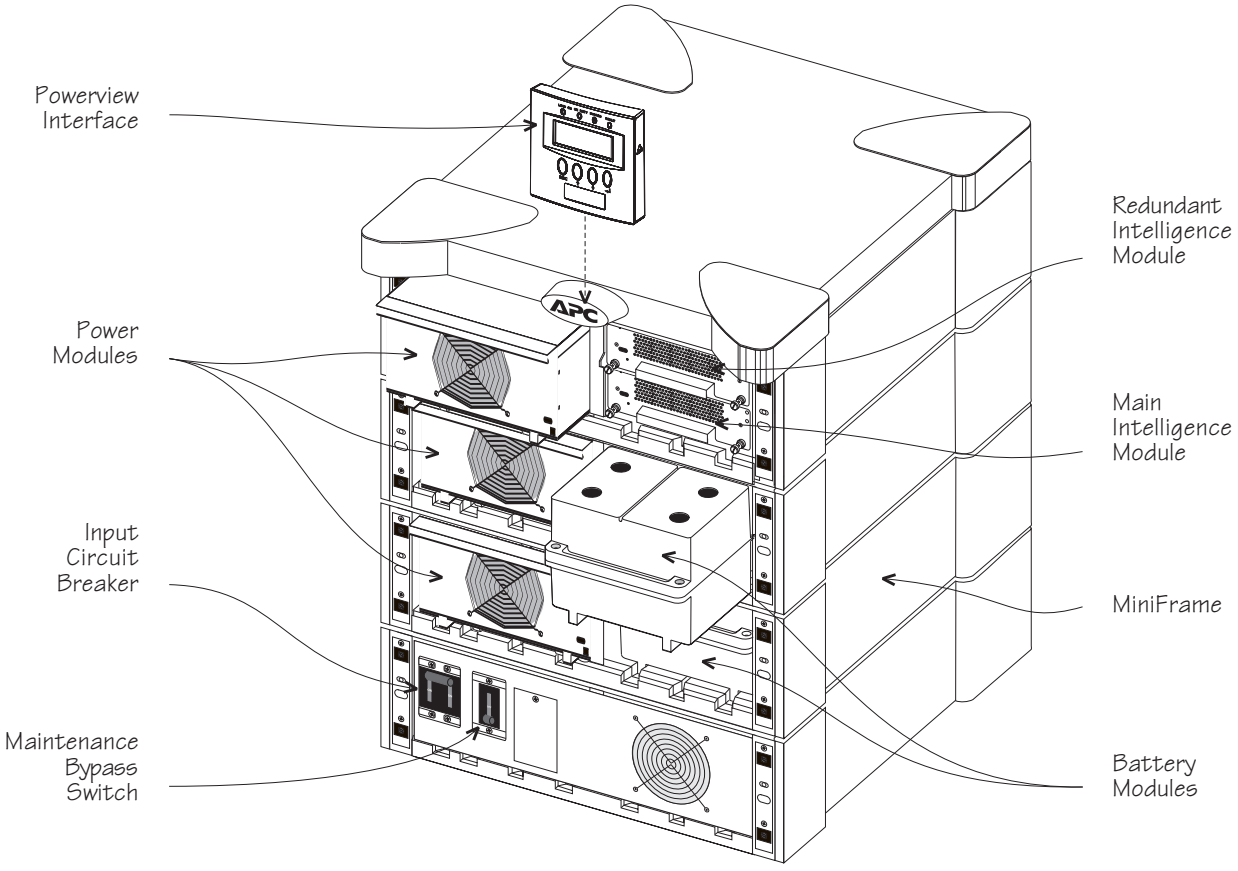


***Fig 1-1** A Fully Loaded MiniFrame (grill covers removed)*

Powerview User Interface

The Powerview incorporates a 4 x 20 alphanumeric LCD screen with four navigation keys, four LED status indicators, and an audible alarm beeper. The display communicates with the Power Array via a local RJ45 connector cable that is hardwired into the top power module bay. It can be mounted on the front of the frame, stand on top of the frame, or it can be installed at a remote location. (A 20' RJ45 cable is provided, and plugs into a communication port at the rear of the frame.) The alphanumeric LCD screen displays system status, fault reporting and module diagnostics information. The navigation keys are used to scroll through an elaborate menu. Chapter 6 provides detailed information about the Powerview.

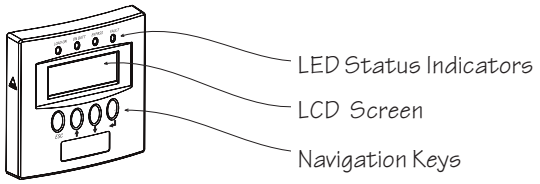


***Fig 1-3** Powerview User Interface*

Alarm thresholds and parameters are set with the Powerview. In the event of an alarm condition, the Powerview emits both audible and visual alarm indicators.

Louvered Grill Covers

Each level of the frame is equipped with a louvered grill cover. These covers are interchangable, and snap securely onto the frame. When removing, temporarily storing, and replacing grill covers, use care to prevent them from being marred or scratched.

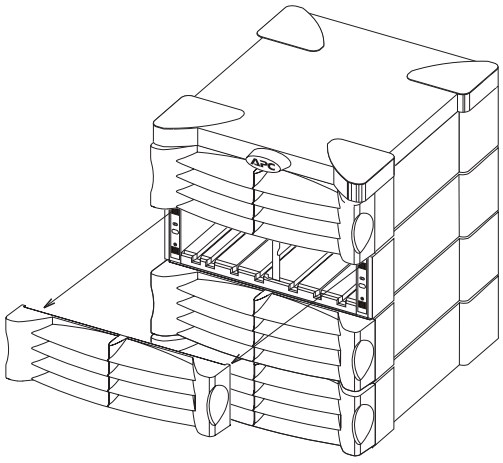


***Fig 1-3** Front Grill Cover Removal and Replacement*

Power Module

The power module is a self-contained, 4kVA UPS (without batteries) housed inside a metal enclosure. A blind mating connector at the rear of the module engages with a connector inside the frame, and powers the unit. Power modules are installed in the vertical column of bays at the left of the frame. These bays are labelled L1, L2, L3, etc.

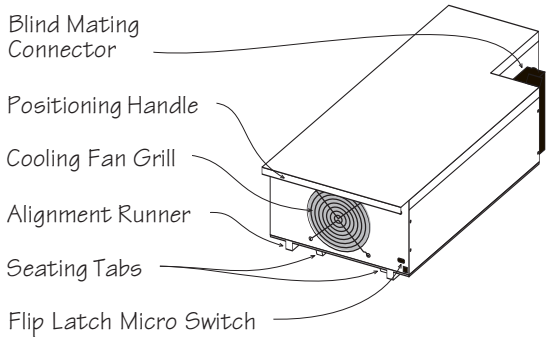


***Fig 1-4** Power Module*

In the event of a power module failure, the Powerview initiates an audible alarm, and displays an error message. The power module is hot-swappable. Instructions for module replacement are provided in chapter 8.

Battery Module

The battery module is comprised of a series of ten 12V batteries housed inside a plastic enclosure. A blind mating connector at the rear of the module engages with a connector inside the frame.

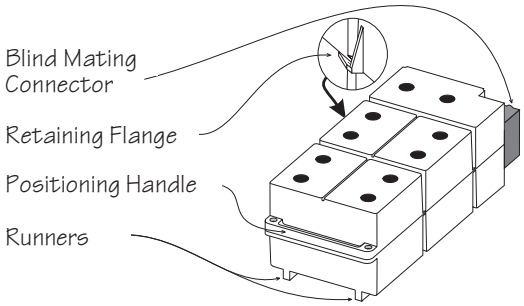


***Fig 1-5** Battery Module*

Battery modules are installed in the vertical column of bays at the right of the frame. These are labelled R2, R3, R4, etc. (The top right bay houses the intelligence modules.) The condition and charge of each battery module is reported on the PowerView. If a battery module fails, an alarm is initiated. Battery modules are hot-swappable, and user replaceable.

Main Intelligence Module (MIM)

The MIM is the onboard computer for the Power Array system. It gathers and processes data, including monitoring the condition of each of the modules.

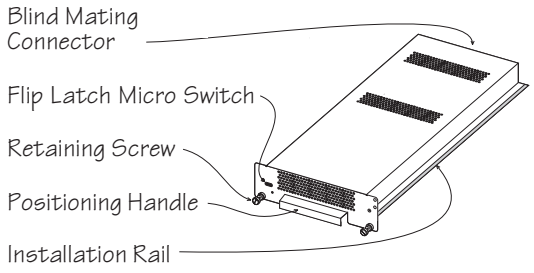


Fig 1-6 *Main Intelligence Module*

The PowerView functions as the user interface for the MIM, and is used to access data, and to configure the system. When a redundant intelligence module is installed and functioning, the main intelligence module can be replaced without placing the load at risk. The main intelligence module also communicates to an external battery frame (if present). The main intelligence module and the redundant intelligence module are factory installed into custom racks that are built into the bay at the upper right of the frame.

Important*: The MIM is always installed in the bottom rack, and the RIM is always installed in the top rack.*

Redundant Intelligence Module (RIM)

The redundant intelligence module is a back-up version of the main intelligence module. It provides redundancy in the event of a MIM failure, or while a MIM is being replaced. If a functioning MIM is present, the RIM can be removed and replaced without placing the load at risk. The condition of the RIM can be determined with the PowerView.

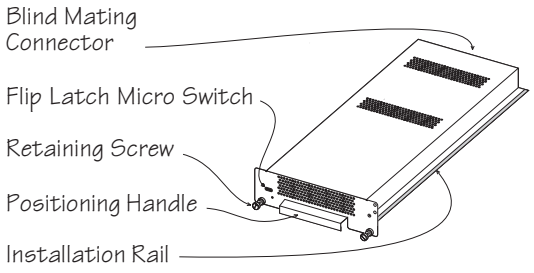


Fig 1-7 *Redundant Intelligence Module*

Input Circuit Breaker

The input circuit breaker protects the Power Array from extreme overloads. When switched to "stand by" the Power Array is disconnected from incoming utility voltage. When switched to the "on" position, power flows from the utility source into the Power Array. Under normal operating conditions, the input circuit breaker always remains in the "on" position.

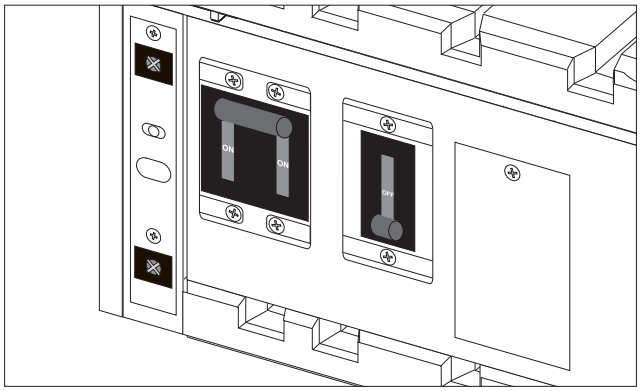


Fig 1-8 *Input Circuit Breaker & Maintenance Bypass Switch*

Maintenance Bypass Switch

When switched to the "on" position, the maintenance bypass switch bypasses the Power Array, and causes the load equipment to be powered directly from utility power. When it is switched to the "off" position, utility power flows into the Power Array, and conditioned power is delivered to the load equipment. *The load equipment is unprotected when the maintenance bypass switch is in the "on" position.* Under normal operating conditions, the maintenace bypass switch always remains in the "off" position.

Rear View of a Power Array

The rear of a MiniFrame system is displayed below. The rear of a MasterFrame is similar. Each of the components are described in a section that follows:

System Enable Switch

The system enable switch regulates internal power to the Power Array. *It does not power the load.* When switched to the "on" position, the Power Array enters the load-disconnect operating mode. When switched to "stand by" the Power Array is disconnected from incoming utility voltage. The load is not powered until the "power the load" command is entered into the PowerView interface.

Communication Interface Ports

The following three communication ports are provided: A remote PowerView cable port; an APC PowerChute *Plus* software interface port, and two battery extension frame communication ports. A 20' RJ45 cable is provided with the Power Array for remote installation of the PowerView.

Smart Slots™ Accessory Ports

APC manufactures a set of auxillary user interface accessories, called *SmartSlot™* devices. Four *SmartSlot™* installation ports are provided. *SmartSlot™* interface options include:

- Protection and safe shutdown of multiple servers
- SNMP adaptor for accessing data via a network
- CallUPS™ - Initiates telephone notification of power event
- MeasureUPS™ - monitoring environmental conditions
- Control and monitor via modem

Note: *Use only SmartSlot™ devices labelled "Symmetra™ compatible."*

REPO/Input/Output Wiring Access Panels

Wiring terminal blocks for input and output wiring, and for remote emergency power off (REPO) switch intallations are accessed through these panels. For use by a licensed electrian.

Power Distribution Unit Panel (Optional)

An optional power distribution unit provides output power receptacles and corresponding circuit breakers. The MiniFrame PDU provides one L6-30R receptacle (208V), two 5-15R receptacles (120V), and two L14-30R receptacles (120V/240V). The MasterFrame PDU provides three L6-30R receptacles, four 5-15R receptacles, and three L14-30R receptacles. The PDU panel for both frame sizes are equipped with a panel circuit breaker.

Battery Extension Frame Connector

An optional Battery Extension Frame can be connected to the Power Array using this coupler. See the *User's Manual* inluded with the Battery Extension Frame.

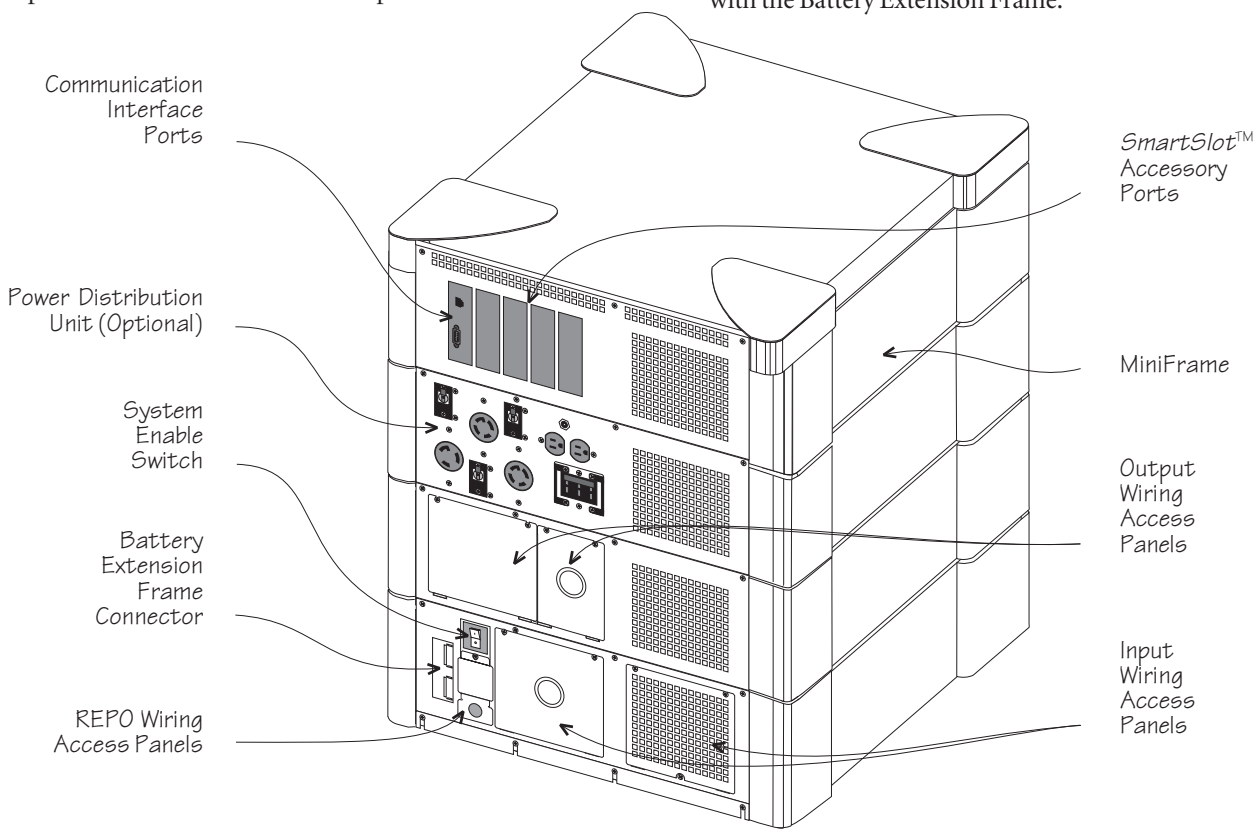
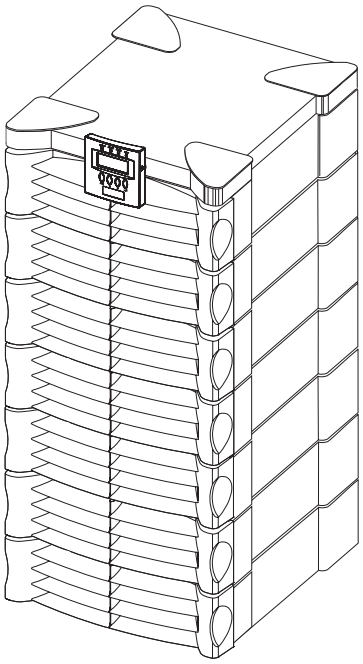


Fig 1-8 *Rear View of a Mini Frame Symmetra™ Power Array System*

Chapter Two

Site Preparation

This chapter provides the site requirements for a Symmetra™ Power Array system. Included are structural and environmental requirements, weights, dimensions and the heat output of a functioning system.



Space and Weight Considerations

All Power Array frames are 24" wide and 27" deep. Refer to table 4-1 for dimensions and weights of fully loaded systems.

Table 2-1 *Power Array Dimensions and Weights (Fully Loaded with Modules)*

Make sure there is adequate space and structural integrity to support the fully loaded frame. Refer to figure 2-1 below. The weight of the Power Array rests on four 1.5" diameter leveling feet. Positions of the leveling feet are shown. When installing the frame, allow 12" of clearance behind the frame for adequate airflow. (The fans on the system pull air in through the front of the frame, and blows it out the back.) Allow 48" of clearance in the front of the Symmetra™ to access the PowerView interface, and for installation and replacement of modules.

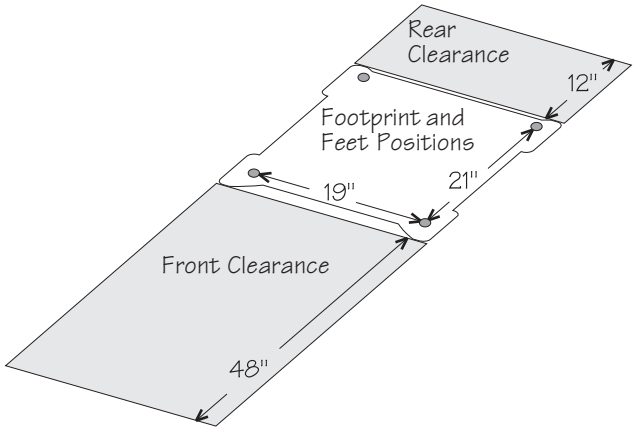


Fig 2-1 *System Footprint and Required Clearance*

Transporting Power Array to Installation Site

When it is shipped, the Power Array frame is bolted to a custom-designed pallet. The modules are stacked on either one or two additional pallets. It is recommended that these pallets be moved from the receiving dock to the installation area with a pallet jack. Make sure there is enough space and structural integrity to move these pallets.

Operating Conditions

The Power Array is intended for installation in a temperature-controlled, indoor area, free of conductive contaminants. The operating evironment must be clean, dry and protected. The atmosphere must be free of dust and corrosive fumes. Adequate airflow must be provided for the operation of the system. Make sure environmental conditions where the Symmetra™ is to be installed are within the following parameters:

- **Operating Relative Humidity:** The Power Array will operate within a relative humidity range of 0 to 95%, non-condensing.
- **Operating Temperature:** The Power Array will operate within a temperature range of 32°F to 104°F (0°C to 40°C).
- **Operating Elevation:** The Power Array will operate at elevations within a range of 0ft to 10,000ft (0m to 3,048m).
- **Electro-Static Discharge (ESD) Susceptibility:** The Power Array and all modules are capable of withstanding "through air" electro-static discharges up to an amplitude of +/-15kV and "direct discharge" electro-static discharges up to an amplitude of +/-8kV without failure, abnormal operation or degradation in performance. ESD test methods conform to IEC 801-2.

BTU Output

Refer to table 2-2 for BTU output of a fully loaded, and functioning Power Array system. The BTU output is significantly higher while the batteries are charging. Under normal operating conditions, battery recharge periods are relatively infrequent.

Table 2-2 *BTU Output*

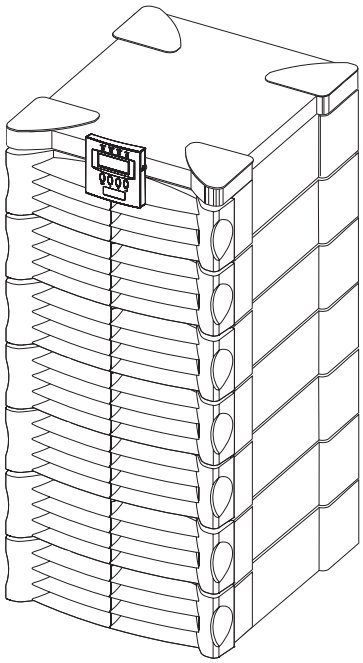
Temporary Storage of Modules

The battery and power modules must be temporarily stored until the frame is permanently installed. To preserve battery life, always store batteries in a cool, dry place.

Chapter Three

Unpacking and Installing Frame

Because the installation process begins on the loading dock, this chapter provides the procedures for inspecting the Symmetra™ Power Array frame and modular components when they arrive. It includes procedures for moving the frame to the installation site, removing it from the pallet, and preparing the frame and the modules for installation.



Initial Inspection

The Symmetra™ Power Array system is shipped on pallets. The system frame is bolted to one pallet, and the modules are boxed, and stacked on one or two additional pallets.

Check For Damage

1. Inspect the Packaging - for damage or signs of mishandling before moving the pallets. If damage is detected, note it on the *Bill of Lading*.

2. If Any Damage Is Detected - file a damage claim with the shipping agency within 24 hours. Contact APC Customer Service at 1-800-800-APCC to inform them of the damage claim, and the condition of the equipment.

3. System Administrator- make sure the system administrator participates in the initial inspection.

Table 3-1 *Dimensions and Weights*

Handling Considerations

1. The Frame Pallet - See Table 3-1 for frame pallet weight and dimensions. Before removing shipping materials, the frame and pallet should be positioned as close as possible to the installation site. The frame is bolted to a specially designed pallet, and is removed from the pallet using a ramp that is included. Use a pallet jack to position the frame pallet.

Note: *Do not attempt to move the frame with a hand dolley.*

2. The Modules Pallet - If possible, it is recommended that the module pallet(s) be positioned as close as possible to the final installation site with the pallet jack. If this is not possible, remove the outer packaging materials from the module cartons, and carry each individual, boxed module to the installation site. See Table 3-1 for module weights.

Tools Required for Setup

The following tools are required to move the pallets into place, remove packaging materials, install the ramp on the frame pallet, and to remove the frame from the pallet.

1. **Large Philips screwdriver**
2. **Adjustable, open-end wrench**
3. **Heavy duty shears**
4. **Sharp utility knife**
5. **Pallet jack**

Storage of Battery and Power Modules

The modules must be temporarily set aside, while the frame is installed and wired. To preserve battery life, always store battery modules in a cool, dry place.

Moving the Frame

1. Plan the Route - Make sure all passages are large enough to accomodate the frame, and the pallet jack. Check to see that the floor has sufficient strength. See Table 3-1 for weights and dimensions. Check doorways, elevators, ramps, etc, to insure there are no non-negotiable corners, step-ups, or offsets. Select a route that provides the smoothest possible floor surface.

2. Staging Area - A smooth, level floor surface is required to position the frame pallet, remove the packaging materials, install the ramp, and for *two people* to carefully roll the frame down the ramp, and onto the floor. See Figure 3-1 below for staging area dimensions.

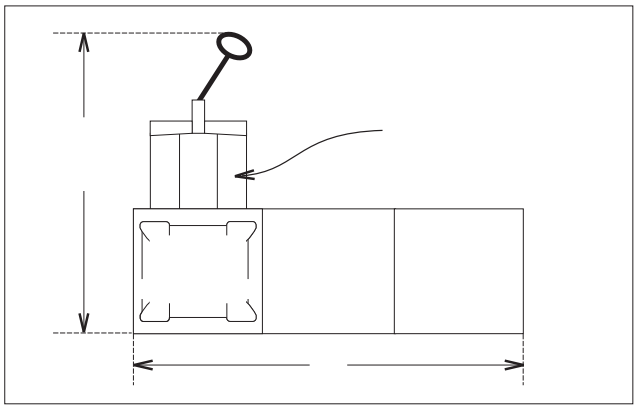


Fig 3-1 *Staging Area*

3. Using a Pallet Jack - Carefully move the frame to the staging area.

Remove Packing Materials

Note: It is recommended that all packaging materials be removed, and temporarily stored, in case any of the system components must be returned to the factory.

1. Remove the Shipping Bands - Using appropriate precautions, carefully cut the plastic shipping bands.

2. Removing the Plastic Wrap - Using care to not damage the surface of the Power Array, cut off the plastic wrap by running the tip of a sharp utility knife along the surface of one of the cardboard corner supports. Remove the plastic wrap from the frame.

3. The Pallet Ramp - The pallet ramp is shipped under the cardboard cap, on top of the frame. It will sometimes become wedged inside the cardboard cap. Use caution removing this cap from the frame. Remove the ramp from the top of the frame.

4. Corner Supports - When the cardboard cap is removed, the four corner supports will fall away. Remove them, and place to one side.

5. Remove the Cover Grills - Remove the grill covers from the frame. Grasp each grill cover by the side finger hold that is molded into them. Pull straight forward. Set the covers to one side. Be careful not to scratch them.

6. Leveling Feet - Fully retract each of the four leveling feet located near the casters on the bottom of the frame.

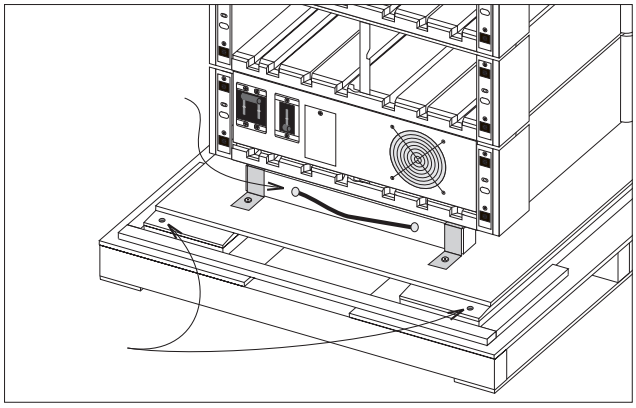


Fig 3-2 *Frame Restraint and Ramp Holes*

Remove the Frame from the Pallet

1. Loosen Rear Bracket Screws - Loosen the two phillips-head screws securing the brackets at the rear of the frame.

2. Remove Two Pallet Restraint Screws - See Figure 3-2. Remove the two phillips-head, pallet restraint screws. Use the cloth handle to remove the frame restraint from the pallet. Place the frame restraint and two screws to one side.

3. Install the Ramp - Position the ramp so that the installation bolts line up with the ramp bolt holes on the pallet. Install the ramp onto the pallet as shown in Figure 3-3.

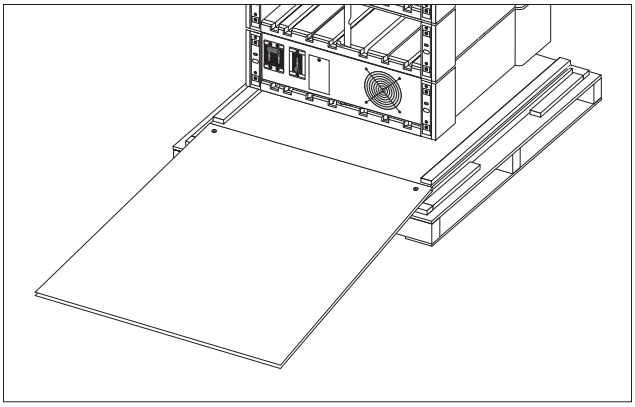


Fig 3-3 *Frame Pallet Ramp*

4. Roll the Frame from the Pallet - ***The following operation requires two people.*** Holding the frame near the center, carefully roll it down the ramp, and onto the floor. (The frame is equipped with casters.)

5. Roll the Frame to the Installation Site - Carefully roll the frame from the staging area to the final installation site.

6. Shipping Material Storage - Gather all shipping materials together, and store it temporarily, in case any system component must be returned to the factory.

Moving Battery & Power Modules

1. Moving All Modules On Pallet - Using the pallet jack, move the modules pallet(s) to the installation site. If necessary, the modules can be moved one at a time. Remove all outer packaging materials from pallet, and carry each boxed module to the final installation site.

3. Stack Modules - Carefully stack the battery and power modules near the installation site. Leave enough room for the electrican to install the wiring to the frame.

Clean-UP

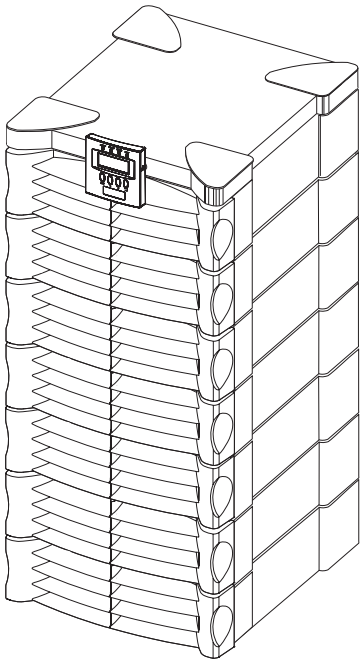
1. Packaging Materials - Remove all packaging materials from the installation site. Store it temporarily, so that it will be available if any components must be returned to the factory.

2. Final Inspection - Check the module bays of the frame to make sure they are clear of debris.

Chapter Four

Wiring Requirements & Procedures

This chapter is addressed to the licensed electrican who will install the input, output and remote emergency power off hardwiring connections. Circuit requirements and minimum wire gauges are included.



Symmetra™ Wiring

Notice!

- *All power and control wiring must be installed by a **licensed electrician only**. All input, output and emergency power off wiring must comply with the National Electric Code (NEC) and applicable local codes.*
- *It is highly recommended that flexible metal conduit be used when hardwiring the Power Array. This will provide for ease of service and maintenance of the system.*

There are four categories of hardwiring installation procedures for the Symmetra™ Power Array. These are; input wiring, output wiring, remote emergency power off switch wiring, and installing an optional local grounding electrode.

Input Wiring

The Power Array requires a single phase 208V or 240V incoming AC utility power source. Incoming power is wired directly to a terminal block inside the Power Array. Specifications and installation procedures are provided.

Output Wiring

Power is distributed to the load equipment via hardwired connections to an output terminal block inside the frame, and by plugging the load equipment into an optional power distribution panel. The Power Array delivers 120V/208V/240V power to the output terminal block. Configurations for hardwiring 120/240V and 120/208/240V output voltages are provied in this chapter. Specifications and installation procedures are provided.

REPO Switch Wiring

The Symmetra™ Power Array can be connected to either a dry contact, or a 24Vdc remote emergency power off (REPO) switch. The wiring terminal connections for the REPO are physically isolated from the primary circuitry of the Power Array. Specifications and installation procedures for REPO wiring are provided.

Local Grounding Electrode

A 1/2" knockout is provided on the output wiring access panel for those sites where NEC code 250-26 requires a local grounding electrode. *This grounding electrode is installed in addition to the equipment safety ground that is run with the input hardwiring connection.* The local grounding electrode is connected from the output terminal block to the nearest effective ground, such as building steel, a metal water pipe, or other appropriate grounding structure. The procedure for installing a local grounding electrode is included in the output wiring procedures.

Note: *The local grounding electrode must meet National Electric Code standards, as per NEC Table 310-16.*

Input Wiring

⚠ Danger!

- *Verify that all incoming line voltage (utility power) and low voltage (control) circuits are de-energized, and locked out before installing cables or making connections, whether in the junction box or to the Symmetra™ Power Array.*
- *Always verify that all battery modules are removed and all battery extension frames are disconnected from the Power Array before installing any wiring to the Power Array.*
- *Read this chapter completely before installing any wiring to the Power Array.*

Input Wiring Specifications

The Power Array requires either a single phase 208V, 50/60Hz, or a 240V, 50/60Hz incoming utility power source. A 3-conductor cable (2 live, 1 ground) is to be brought to the input wiring terminal block inside an adequate length of flexible metal conduit. To minimize disturbances caused by other loads in the building, input wiring should be supplied directly from the service entrance (a dedicated power feeder). All electrical service, both input and output, must be sized in accordance with the NEC and any local building codes. The circuit for input power must be adequate to carry the full load of the system and the load equipment. The 3-conductor input cable should be sized for no more than 3% voltage drop. A 3/4" knockout in the input wiring access panel provides access to the terminal block.

See table 4-1 for input wiring specifications.

Input Wiring Procedures

An input voltage jumper must be manually set before input wiring can be installed. Follow the procedure below:

Voltage Jumper Procedure

1. Refer to figure 4-1. Remove the screw that secures the voltage select access panel to the frame. Place the screw and access panel aside temporarily.

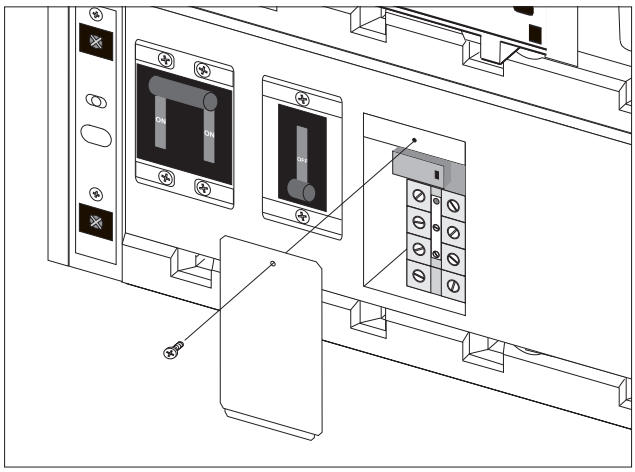


Fig 4-1 *Voltage Select Access Panel*

2. Use a small, flat head screwdriver to position the input voltage jumper to the correct voltage setting. See figure 4-2. Do not overtighten screws.

Note: *When the input voltage jumper is in the 240V position, the jumper bar activates a micro switch at the top of the terminal block. In the 208V position, the micro switch is not activated.*

Input Voltage (2-wire plus ground)	Frame Size (Max. kVA Rating)	Input Full Load Amperage	Input Overcurrent Protection (External)	Minimum Input Wire Gauge	Minimum Ground Wire Gauge
208Vac	Mini (8kVA) Master (16kVA)	40 Amp 80 Amp	50 Amp 100 Amp	#8 Gauge #3 Gauge	#8 Gauge #3 Gauge
240Vac	Mini (8kVA) Master (16kVA)	35 Amp 70 Amp	50 Amp 100 Amp	#8 Gauge #3 Gauge	#8 Gauge #3 Gauge

Table 4-1 *Input Wiring Specifications*

3. After the electrical wiring test/checklist is completed (end of this chapter), replace the voltage select access panel.

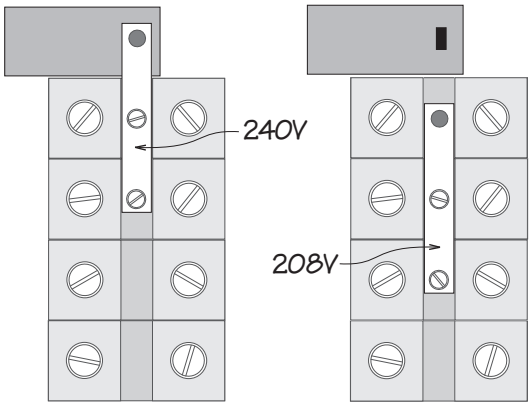


Fig 4-2 *Input Voltage Jumper*

Input Wiring Procedure

1. Refer to figure 4-3. Locate the input wiring entry and input wiring inspection panels.

2. Remove the four screws securing the panels to the frame. Remove only the screws indicated in the illustration. Place the screws and panels to one side.

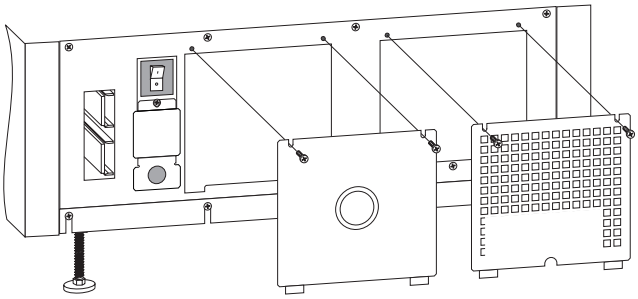


Fig 4-3 *Removal of Input Hardwiring Panels*

2. Pull the three input wires through conduit, leaving about 20" of wiring extending from the end. Install a flexible metal conduit connector to the end of the conduit. Using appropriate tools, remove the knockout in the entry panel. Feed the wires through the entry panel, and attach the flexible metal conduit connector to the panel. Strip 1/2" of insulation from the end of each of the incoming wires.

3. Feed wire into the entry compartment through the wiring pathway hole between the input wiring entry compartment and the input wiring compartment. See figure 4-4 for the input wiring pathway.

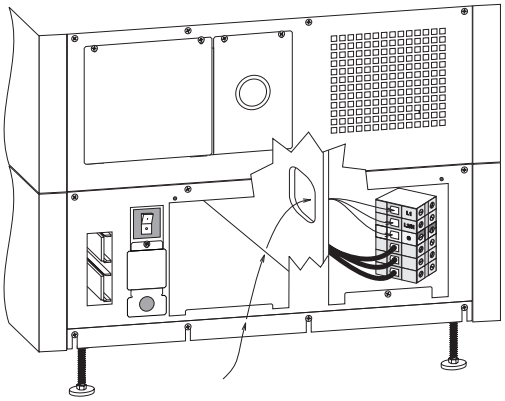


Fig 4-4 *Input Wiring Pathway*

4. Connect input wires to the input terminal block connections labelled L1, L2/N and Ground as shown in figure 4-5. Make sure there are no loose strands and that the terminal connection screws are sufficiently tightened. Connections are the same for 208V or 240V incoming voltages.

Note: *In North America, L2/N is a phase (hot) connection. In Europe, L2/N indicates a neutral connector.*

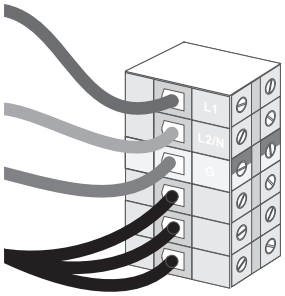


Fig 4-5 *Input Hardwiring Configuration*

5. Carefully fold the excess wiring into the entry compartment. After the electrical wiring test/checklist is completed (end of this chapter), replace the input wiring panels.

Output Wiring

Output voltage is delivered to the load equipment via hardwired connections and/or via receptacles on an optional power distribution unit (PDU). To facilitate maintenance and service of the Power Array, it is recomended that flexible metal conduit be used for all hardwiring connections.

See table 4-2 for output wiring specifications.

Output Wiring Configurations

The Power Array is typically wired to deliver either120V/240V, or 120V/208V/240V output voltages. The internal wiring to the output terminal block is depicted in figure 4-6. Note the neutral ground bond in figure 4-7. Wiring configurations for installations with a power panel are provided in figures 4-8 and 4-9. If wiring is to be connected directly to the load equipment, refer to table 4-3 for the correct terminal connections.

Note: *Use only the connections shown in table 4-3. All others will yield voltages other than normal utility voltages.*

Voltage	Connections*
120V	2-8 or 6-8
240V	2-6
208V	4-6
****Use only these connections. All other combinations will yield voltages other than normal utility voltages.***	

Table 4-3 *Terminal Block Voltage Combinations*

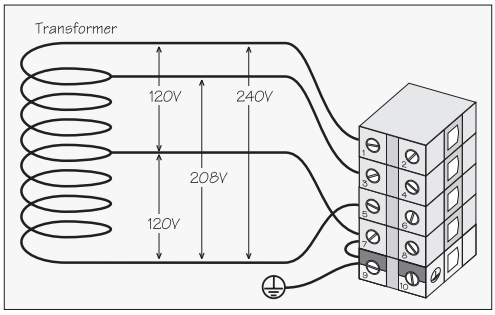


Fig 4-6 *Voltages Delivered to the Output Terminal Block*

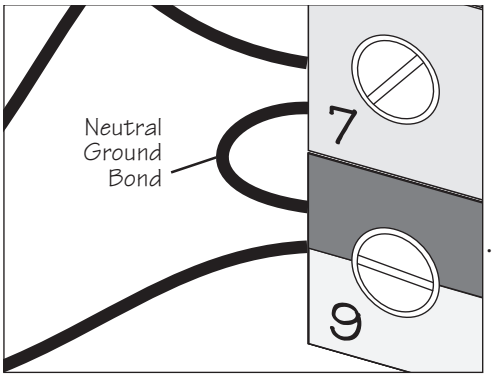


Fig 4-7 *Output Wiring Neutral Ground Bond*

Output Overcurrent Protection

Symmetra™ requires output voltage overcurrent protection in accordance with the ratings in table 4-2. If an optional PDU is installed on the Power Array, the panel circuit breaker acts as the overcurrent protection for the PDU receptacles *and the hardwired connections.* See figure 4-11 and 4-12. If a PDU panel is not installed, circuit breakers must be installed in the power panels as shown in figures 4-8 and 4-9.

Output Voltage	Frame Size (Max. kVA Rating)	Maximum Output Per Conductor	Output Overcurrent Protection (External)	Minimum Output Wire Gauge	Minimum Ground Wire Gauge
120/240Vac (2-wires + ground)	Mini (8kVA)	40 Amp	50 Amp (2-pole)	#8 Gauge	#8 Gauge
	Master (16kVA)	80 Amp	90 Amp (2-pole)	#3 Gauge	#3 Gauge
120/208/240Vac (3-wires + ground)	Mini (8kVA)	40 Amp	50 Amp (3-pole)	#8 Gauge	#8 Gauge
	Master (16kVA)	80 Amp	90 Amp (3-pole)	#3 Gauge	#3 Gauge

Table 4-2 *Output Wiring Specifications*

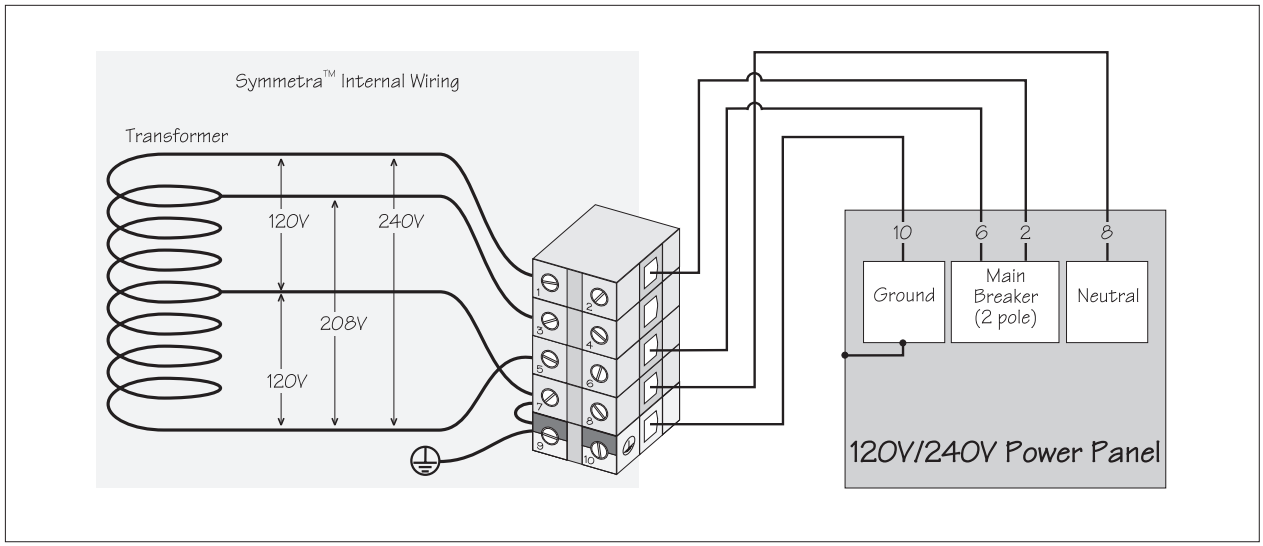


Fig 4-8 *Output Wiring Configuration for 120V/240V Output Voltages*

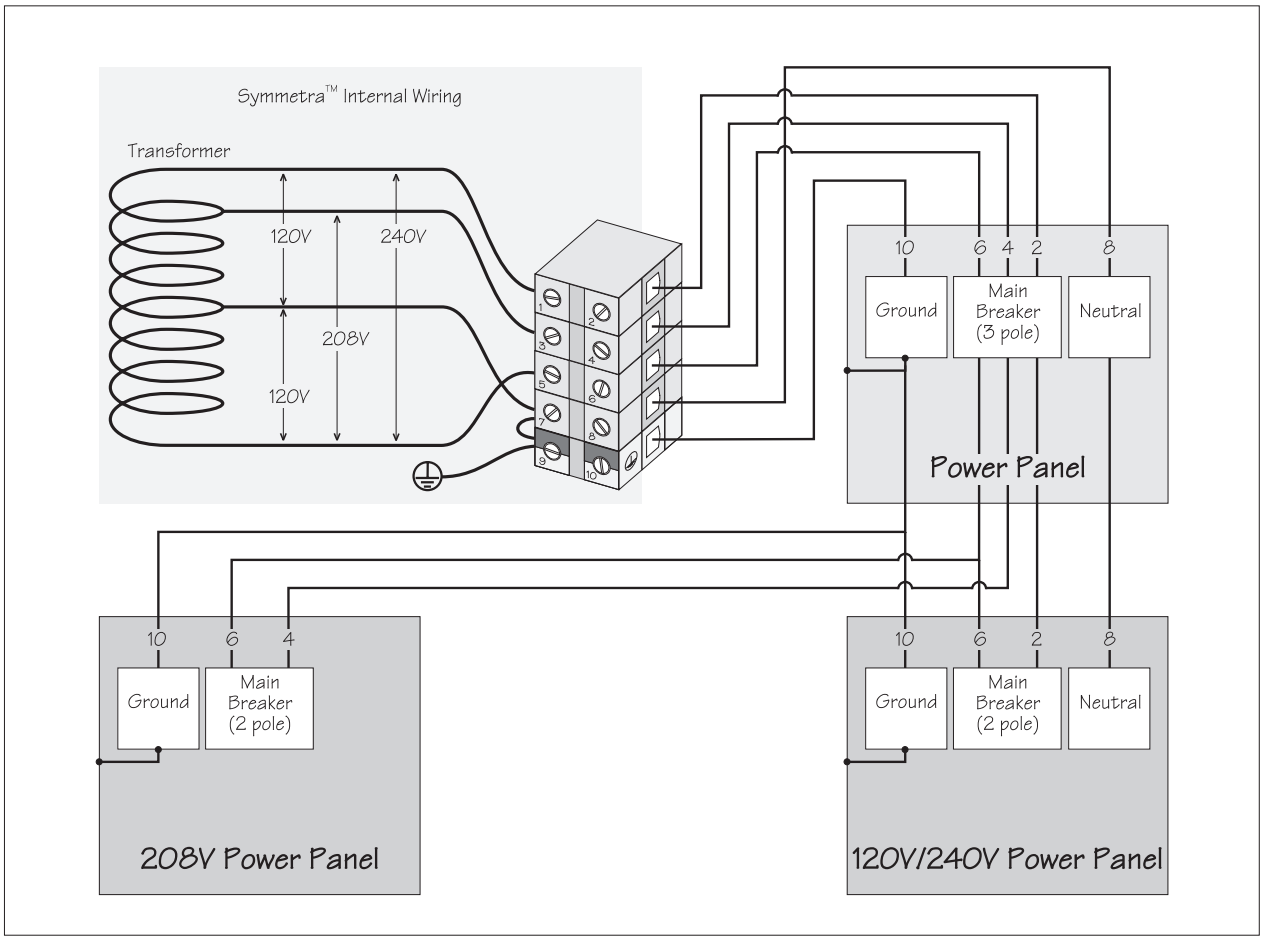


Fig 4-9 *Output Wiring Configuration for 120V/208V/240V Output Voltages*

Output Wiring Installation

⚠ Danger!

- *Verify that all incoming line voltage (utility power) and low voltage (control) circuits are de-energized, and locked out before installing cables or making connections, whether in the junction box or to the Symmetra™ Power Array.*
- *Always verify that all battery modules are removed and all battery extension frames are disconnected from the Power Array before installing any wiring to the Power Array.*
- *Read this chapter completely before installing any wiring to the Power Array.*

Output Wiring Procedure

1. Refer to Fig 4-10. Remove the four screws holding the output wiring entry panels to the rear of the Power Array. Remove only the screws indicated in the illustration. Set the screws and both panels aside temporarily.

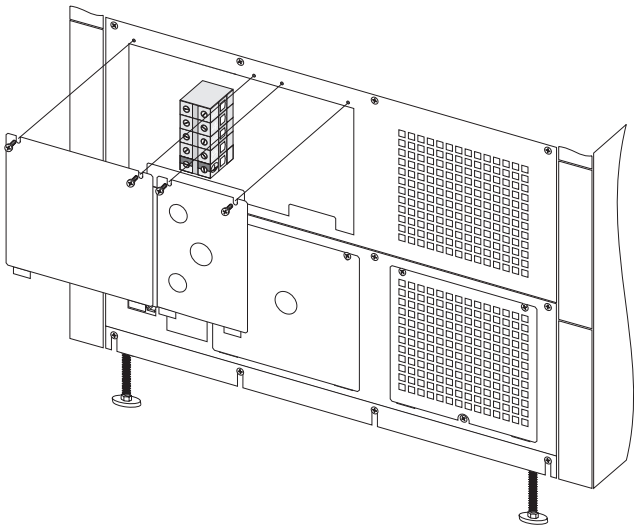


Fig. 4-10 *Removal of Output Hardwiring Panels*

2. Pull wire through conduit, leaving about 20" of wiring extending from the end. Install a flexible metal conduit connector to the end of the conduit. Using appropriate tools, remove the knockout in the entry panel. Feed the wires through the entry panel, and attach the flexible metal conduit connector to the panel. Strip 1/2" of insulation from the end of each of the incoming wires.

3. Use the output wiring configuration that corresponds to the output load voltage. See figures 4-8 and 4-9. Connect output wiring to the output terminal connections. Make sure there are no loose strands and that the terminal connection screws are sufficiently tightened.

Grounding Electrode (Optional)

If installing an optional grounding electrode, use the 1/2" knockout in the output wiring panel, and attach the grounding electrode to the output terminal block ground connection. (Use a strain relief clamp, or a flexible metal conduit connector.) Connect the local grounding electrode to the nearest effective ground, such as building steel, a metal water pipe, or other appropriate grounding structure.

See NEC code 250-26 and Table 310-16.

4. Carefully fold excess output wiring into the terminal compartment. After the electrical wiring test/checklist is completed (end of this chapter), replace the output wiring access panels.

Power Distribution Units (Optional)

An optional power distribution unit provides output power receptacles and corresponding circuit breakers. The MiniFrame PDU provides one L6-30R receptacle (208V), two 5-15R receptacles (120V), and two L14-30R receptacles (120V/240V). The MasterFrame PDU provides three L6-30R receptacles, four 5-15R receptacles, and three L14-30R receptacles. The PDU panel for both frame sizes are equipped with a panel circuit breaker.

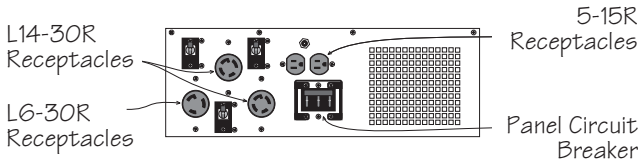


Fig. 4-11 *MiniFrame PDU Panel*

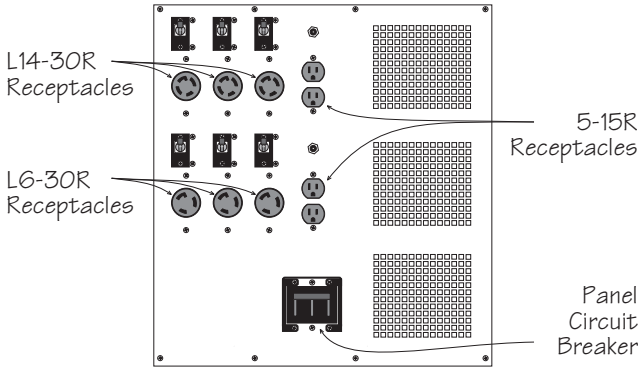


Fig. 4-12 *MasterFrame PDU Panel*

Remote Emergency Power Off Switch

The Power Array can be de-energized with a remote emergency power off (REPO) switch. REPO switches are common in computer rooms where, for safety reasons, power to the loads must be quickly disconnected. The REPO switch physically flips the system enable switch to "stand by" mode. This cuts all power to the Power Array, and to the load equipment. The system enable switch must be physically reset.

The REPO can be connected to either a switched, 24Vdc circuit, or a simple, contact closure.

REPO Specifications

The REPO circuit is considered a Class 2 and SELV circuit.

SELV is an acronym for "Safety Extra Low Voltage." SELV is a common term in Europe and IEC standards. A SELV circuit is isolated from primary circuitry through an isolating transformer and designed so that under normal conditions, the voltage is limited to 42.4 Vpeak or 60 Vdc.

A Class 2 Circuit is a common term in North America and in UL and CSA standards. It is defined in the Canadian Electrical Code (C22.1, Section 16), and the National Electrical Code (NFPA 70, Article 725).

SELV and Class 2 circuits must be isolated from all primary circuitry. Do not connect any circuit to the EPO terminal block unless it can be confirmed that the circuit is SELV or Class 2. If there is a question, use a contact closure switch.

Cable Specifications

The cable that connects Symmetra™ to the Emergency Power Off switch should be UL Listed, type:

CL2 - Class 2 cable for general purpose use; or

CL2P - Plenum cable for use in ducts, plenums and other space used for environmental air; or

CL2R - Riser cable for use in a vertical run in a shaft or from floor to floor; or

CL2X - Limited Use cable for use in dwellings and for use in raceway.

For installation in Canada, the cable should be CSA Certified, type ELC (Extra-Low-Voltage Control Cable).

REPO Switch Installation

⚠ Danger!

- *Verify that all incoming line voltage (utility power) and low voltage (control) circuits are de-energized, and locked out before installing cables or making connections, whether in the junction box or to the Symmetra™ Power Array.*
- *Always verify that all battery modules are removed and all battery extension frames are disconnected from the Power Array before installing any wiring to the Power Array.*
- *Read this chapter completely before installing any hardwiring connections to the Power Array.*

REPO Wiring Procedures

Remove the REPO wiring access panel to access the terminal connections.

1. Refer to figure 4-13. Remove the screw holding the two piece access panel at the rear of the Power Array. Remove the panel. Set the screw and the panel aside temporarily.

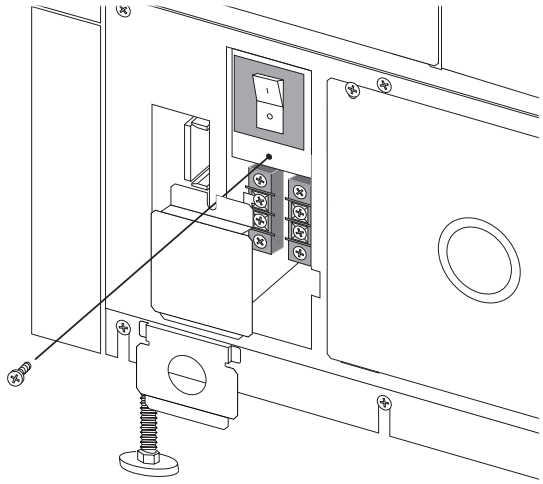


Fig 4-13 *Removal of REPO Wiring Panels*

2. Refer to figures 4-14 and 4-15. Select the configuration that matches the type of REPO switch that is to be installed. ***Note:*** *An existing jumper must be removed from the terminal block if a 24Vdc REPO switch (Figure 4-15) is to be installed.*

3. Extend the wiring from the switch to the Power Array. Strip 1/2" of insulation from the end of each of the incoming wires.

4. Feed the wires through the knockout in the access panel, and install a strain relief (Romex) connector.

5. Make sure there are no loose strands and that the terminal connection screws are sufficiently tightened.

6. After the electrical wiring test/checklist is completed (end of this chapter), replace the REPO access panel.

Contact Closure REPO Switch Connection

Connect the contact closure REPO wiring to the terminal block as illustrated in figure 4-14 below.

Note: *The factory installed jumper remains as shown.*

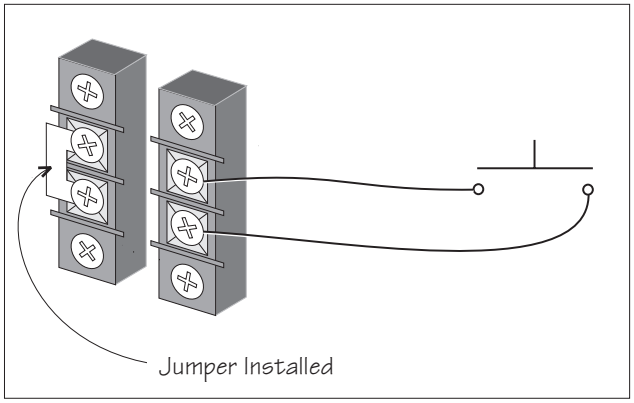


Fig 4-14 *Dry Contact Switch*

24 Vdc REPO Switch Connection

Connect the 24Vdc REPO wiring to the terminal block as illustrated in figure 4-15 below.

Note: *The factory installed jumper must be removed.*

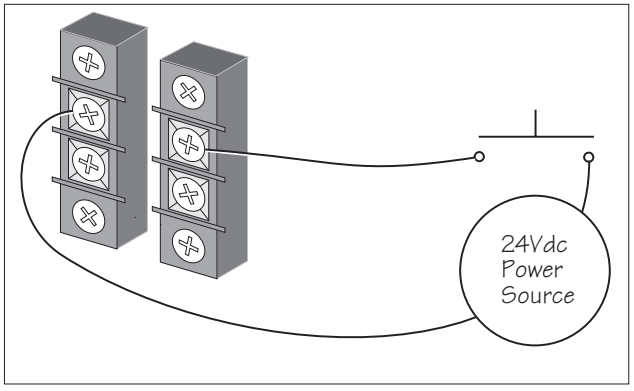


Fig 4-15 *24Vdc EPO Switch*

Electrical Wiring Test

The following test procedure will ensure the Power Array has been correctly hardwired. It is intended that the licenced electrician who installed Power Array will perform this test. A true RMS voltmeter is required for this procedure.

Before this test can be conducted, the main intelligence module (MIM) must be installed, and the PowerView display must be connected to the Power Array. Refer to chapter 5 for procedures to install the MIM and the PowerView. The power and battery modules need not be installed to perform this test.

Note: *This test is intended to verify the electrical connection to the Power Array, not to verify it's operation or explain it's usage. In this procedure, you will be instructed to ignore PowerView messages, etc. Refer to chapters 6 & 7 for detailed information about the operation of the Power Array.*

Electrical Wiring Test/Checklist

❑ **1.** Make sure all three switches - system enable, maintenance bypass, and input circuit breaker are in the "off" or "stand by" position. Make sure all load equipment is either turned off, or is unplugged from the Power Array.

❑ **2.** Use a true RMS voltmeter to measure the input AC voltage at the terminal connections at the rear of the frame (bottom level).
Note: *If input voltage is less than 156Vrms or greater than 276Vrms, check input wiring for errors. DO NOT PROCEED UNTIL THE INPUT VOLTAGE IS WITHIN THIS RANGE.*

Record the input voltage here: _____

❑ **3.** Check for proper ground installation. If available, a ground ohmmeter should be used. Otherwise, check for continuity to building ground.

❑ **4.** Switch the input circuit breaker to the "on" position.

❑ **5.** Switch the system enable switch to the "on" position.
Note: *The Power Array may make a series of clicking sounds as it runs through an initial self test.*

❑ **6.** Using the PowerView display, read and record the reported input voltage from the startup screen. ("122Vin" in figure 4-16 indicates that the input voltage is 122V.)
Note: The PowerView may display one or more messages such as "Number of Battery Modules Changed." Press the ESC key until the startup screen appears.

Record the PowerView reported input voltage here: _____

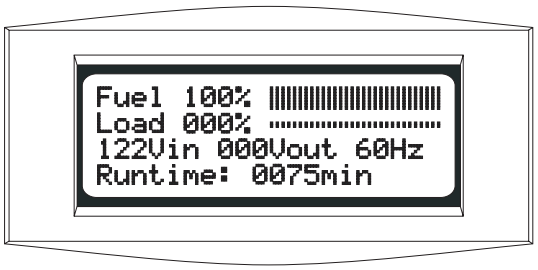


Fig 4-16 Startup Screen

❑ **7.** Compare the RMS input voltage measurement (Step #2) with the input voltage as reported by the PowerView. If the reported input voltage is not within +/-5% of the recorded input voltage, check the wiring, and measure the input voltage again. If the two measurements are still outside of the acceptable range, contact APC Symmetra™ technical support at **1-888-809-TECH**.

❑ **8.** Switch the maintenance bypass switch to the "on" position. The Power Array will go into the manual bypass mode, and voltage should now be present at the output terminal connections. The bypass LED on the PowerView display will glow, and an audible alarm may sound, and one or more messages may appear. Ignore these messages by pressing the ESC navigation key on the PowerView display, until the startup screen reappears. See figure 4-16. Read and record the output voltage that is indicated on the PowerView. ("000Vout" in figure 4-16 indicates that the output voltage is 000V.)
Note: The reported output voltage should be approximately 208V or 240V, depending on how the system is configured.

Record the PowerView reported output voltage here: _____

❑ **9.** Measure the output AC voltage at the output wiring terminal block connections as specified in table 4-4 below. Record the measured values in the table. The measured values should correspond to the nominal values listed in the table. If the input voltage varies from 208V or 240V, the output voltages vary accordingly. In this case, use the multipliers in table 4-4 to calculate the expected output voltages. If these voltages still vary, contact Symmetra™ technical support at **1-888-809-TECH**.

❑ **10.** Successful completion of steps 1 through 9 indicate that Power Array is correctly wired to the utility power source, and that the correct output voltage is available at the output terminal block. Load equipment voltage requirements and external wiring voltages can be checked and verified at this time.

❑ **11.** Shut down the Power Array by switching the input circuit breaker and the system enable switch to the "off" position. Replace all wiring access panels on the Power Array frame. The electrical connections have now been properly installed and checked. The Power Array is now ready for the setup procedure in chapter 5.

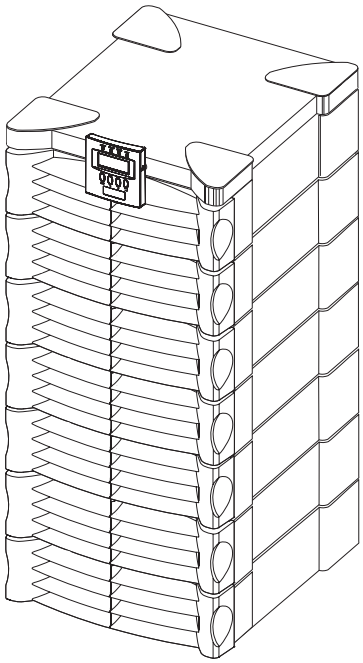
Terminals	Nominal Voltage	Measured Value	Multipliers (Based on Voltage Jumper Position) VOut(measured) = Vin(measured) * multiplier	
			208V Position	**240V Position**
2 & 6	240 Vac		1.15	1.01
4 & 6	208 Vac		1.0	.866
2 & 8	120 Vac		.576	.5
6 & 8	120 Vac		.576	.5
8 & 10	0 Vac		0 Volts	0 Volts

***Table 4-4** Input/Output Measured Voltage Multipliers*

Chapter Five

Setting Up The Power Array

Set up procedures include leveling the frame,
installing the battery and power modules
and connecting the Powerview user interface.



Setup of Power Array

After the wiring connections have been installed and checked by the electrican, the Power Array is ready for the installation of the battery and power modules. After they are installed, the louvered cover grills are replaced onto the frame, and the PowerView user interface is mounted on the frame.

Frame Leveling Procedure

Position the Power Array so there will be adequate airflow clearance in the front and the rear of the frame. See figure 2-1 in chapter 2. The weight of the Power Array is supported by four 1.5" leveling feet pads. Four metal plates can be placed under each of the leveling feet pads to help displace the weight of the Power Array.

The procedure for leveling the frame is as follows:

1. Hand turn all four leveling feet until the pads make contact with the floor.

2. Use an open-end wrench to extend each of the leveling feet, by turning the hex nut three complete revolutions.

3. Using a torpedo level, adjust the leveling feet until the frame is level.

Removing Cover Grills

The louvered cover grills must be removed before the power and battery modules can be installed. The procedure for removing the cover grills is as follows:

Note: *Handle covers with care to prevent scratching them.*

1. Grasp one of the cover grills by the the side holds that are molded into it. See figure 5-1.

2. Pull the cover straight forward.

3. Cover will unsnap from frame.

4. Remove all cover grills in this manner, and place them to one side.

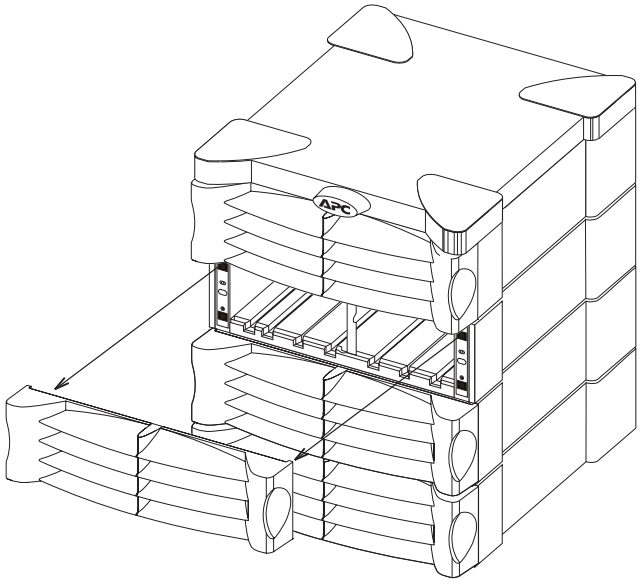


Fig 5-1 *Removing Cover Grills from Frame*

Installing the Battery Modules

⚠ Caution!

- *Each battery module weighs 60 lb. Battery module installation and handling requires two people to lift the module.*

Procedure for Battery Module Installation

1. Clear all battery module bays of any debris. Make sure the alignment tracks are clear, and free of obstruction.

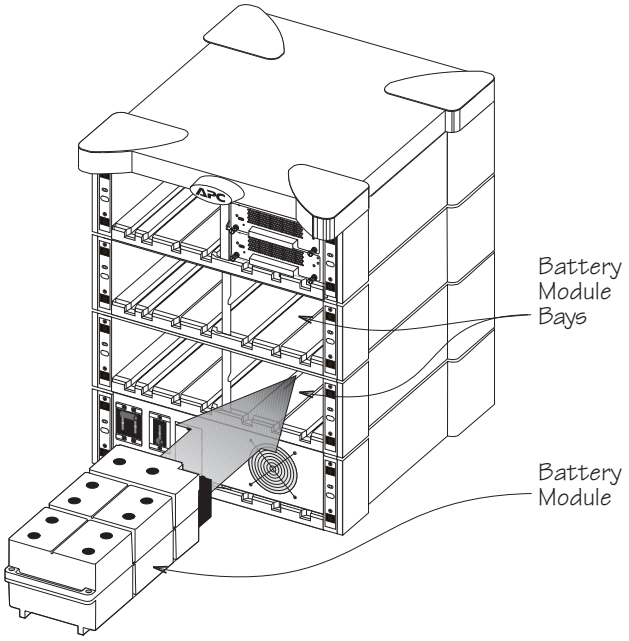


Fig 5-2 *Location of Battery Module Bays*

2. There are two alignment grooves molded into the bottom of the battery module bay. These correspond with runners that are molded into the bottom of the battery module. See figure 5-3.

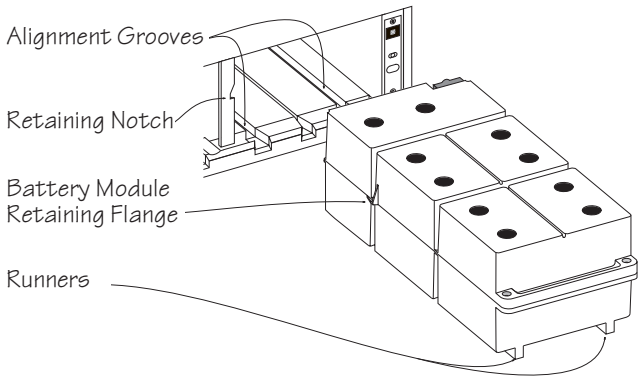


Fig 5-3 *Battery Alignment Grooves and Runners*

3. With one person on either side of the battery module, lift the module, align the runners with the alignment grooves, and slide module into the bay.

Note: *When installing power or battery modules, always install them in the lowest available bays. Installing modules in this manner minimizes lifting, and lowers the center of gravity of the Power Array system.*

4. As the battery module slides into the bay, the retaining flange will fall behind the notch in the frame. See figure 5-4. When a battery module is being removed, this flange prevents the battery from falling out of the bay until both people have assumed the full weight of the module.

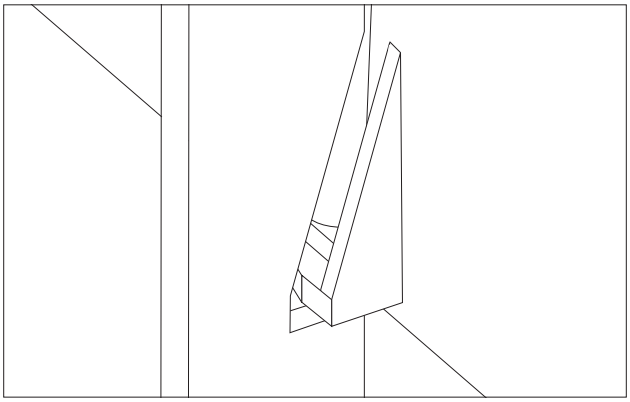


Fig 5-4 *Battery Module Retaining Flange*

5. To engage the internal electrical connector, the battery module must be swiftly and firmly pushed into place. The design of the battery module incorporates a "drop lock" that will engage when the battery module is properly seated in the bay. If the internal connector does not engage, a slight tug will move the module. If it is locked, the battery module will not move, and must be slightly lifted before it can be pulled from the bay.

Installing the Power Modules

The vertical column of bays at the left of the frame house the power modules. See Figure 5-5.

Procedure for Power Module Installation

1. Clear all power module bays of debris. Make sure the alignment grooves are clear, and free of obstruction.

Note: *The PowerView cable must be held up and out of the way, while a power module is installed in bay "L1."*

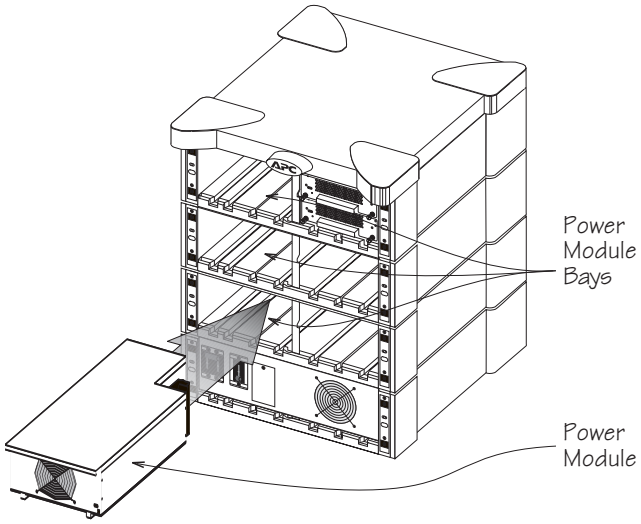


Fig 5-5 *Location of the Power Module Bays*

2. There are two alignment grooves molded into the bottom of the power module bay. These correspond with runners that are molded into the bottom of the power module. See figure 5-6.

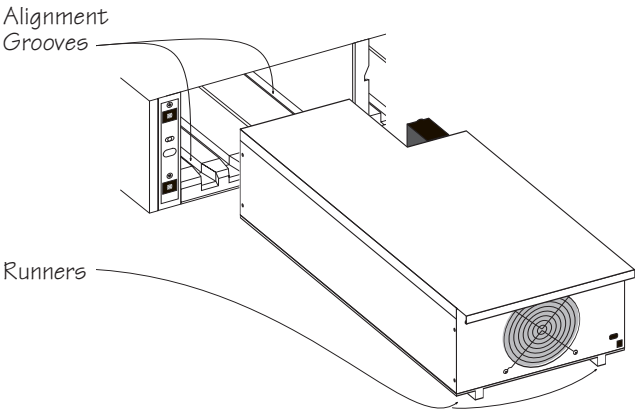


Fig 5-6 *Power Module Alignment Grooves and Runners*

4. Make sure the alignment grooves and the runners are lined up. Slide the power module into bay. See figure 5-6.

5. To engage the internal connector, slide the power module firmly into the bay. The "drop lock" tabs will fall into place. See figure 5-7.

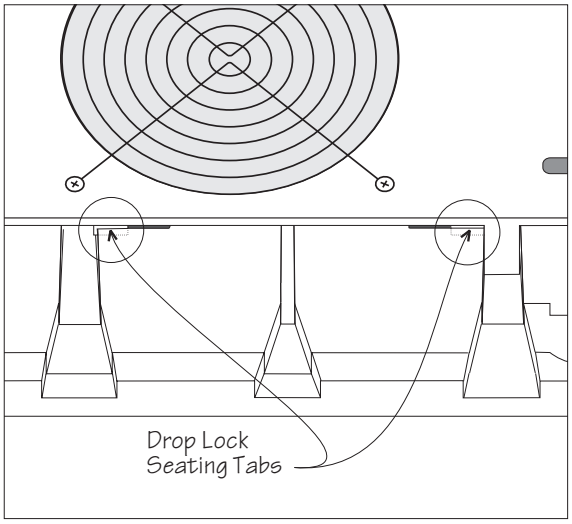


Fig 5-7 *Seating Tabs When Module is Properly Installed.*

6. Swing the flip latch up and fasten the captive screw into the module. Gently tighten screw until it is firmly in place. **DO NOT overtighten screw.**

Note: *The flip latch will not engage if the power module is not fully seated into the bay. The flip latch activates a micro switch inside the power module. If the latch is not properly installed, the power module will not function. If after installing the power module, the flip latch will not engage, pull the power module out of the bay, and firmly slide it into place.*

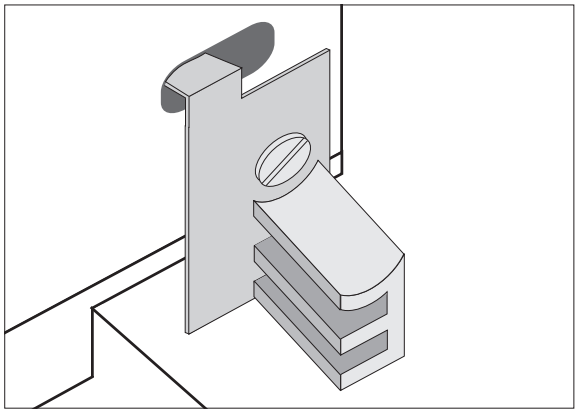


Fig 5-8 *The Power Module Flip Latch*

Installing the Main Intelligence Module (MIM)

The main intelligence module is factory installed. The following procedures is provided in the event that the module is removed, or needs to be replaced.

Procedure for Main Intelligence Module (MIM) Installation

1. The main intelligence module fits into a bay at the upper right corner of the Power Array frame.

Note: *The main intelligence module is always installed in the bottom of this bay, and the redundant intelligence module is always installed in the top.*

2. Carefully align the installation rail on the MIM, with the track that runs along the inside of the bay.

4. Slide the MIM into the bay.

5. Tighten the two retaining screws. **Do not overtighten.**

6. Swing the flip latch into place, and tighten the screw. **Do not overtighten.**

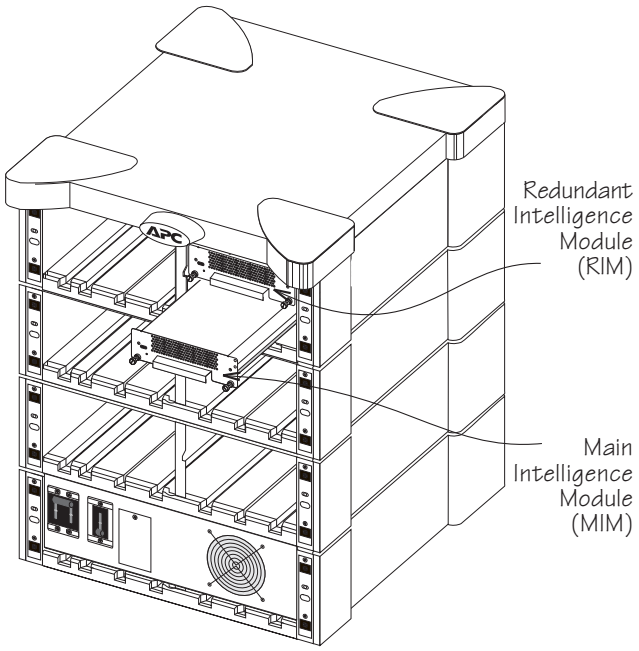


Fig 5-9 *Location of the MIM and RIM*

Installing the Redundant Intelligence Module (RIM)

The redundant intelligence module is factory installed. The following procedures is provided in the event that the module is removed, or needs to be replaced.

Procedure for Redundant Intelligence Module (RIM) Installation

1. The redundant intelligence module fits into a bay at the upper right corner of the Power Array frame.

Note: *The redundant intelligence module is always installed in the top of this bay, and the main intelligence module is always installed in the bottom.*

2. Carefully align the installation rail on the RIM, with the track that runs along the inside of the bay.

4. Slide the RIM into the bay.

5. Tighten the two retaining screws. **Do not overtighten.**

6. Swing the flip latch into place, and tighten the screw. **Do not overtighten.**

Installing the PowerView Interface

An 18" RJ45 cable (supplied) is provided in bay "L1." It is used to connect the PowerView to the Power Array. Use the following procedure to install the PowerView interface to the front of the frame.

1. Remove the cover grill from the top level of the frame.

2. Feed the end of the RJ45 cable through the center slot of the top cover grill, and replace the cover grill onto the frame. See figure 5-10.

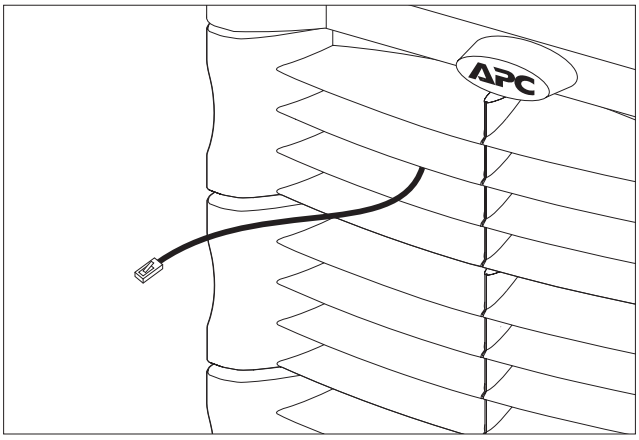


Fig 5-10 *PowerView Cable Through Cover Grill*

3. Connect the RJ45 plug into the receptacle on the back of the PowerView as shown in figure 5-11.

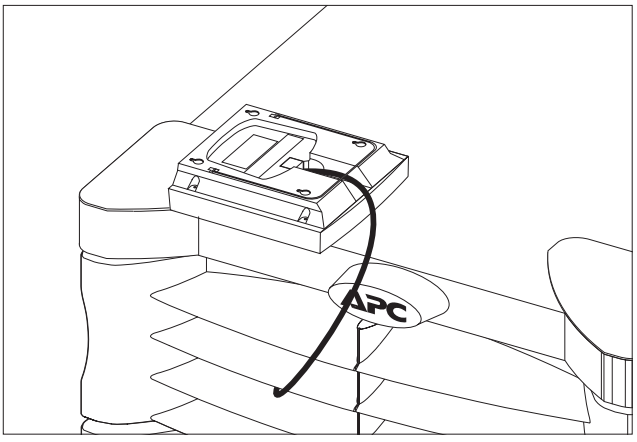


Fig 5-11 *Attaching the Cable to the PowerView*

5. Position the PowerView over the mounting post on the front of the frame, and push straight down. The PowerView snaps into place. See figure 5-12.

6. Tuck the excess cable into the grill cover.

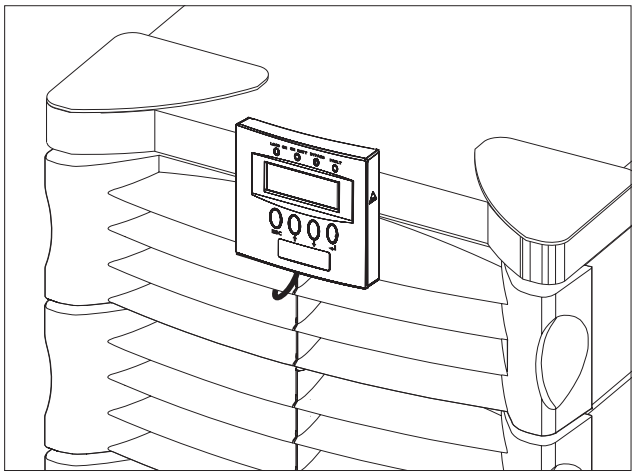


Fig 5-12 *Install PowerView Onto Frame*

Remote Placement of the PowerView

The PowerView can be mounted at a remote location, up to 20' from the frame. Follow the steps below to install PowerView in a remote location.

1. A 20' RJ45 cable is included with the Symmetra™ Power Array.

2. Connect one end of the RJ45 cable to the rear of the Power Array frame. See figure 1-8 in chapter 1.

3. Connect the other end of the cable to the receptacle at the rear of the PowerView interface.

4. The short RJ45 cable at the top of power module bay "L1" can be safely tucked onto the top of the power module. Replace the grill cover.

The PowerView will sit upright on a flat surface, by folding out the wire bail on the back. It can also be mounted to a wall.

Wall Mounting the PowerView

1. Note the four mounting slots molded into the back of the PowerView body.

2. Use the template in figure 5-13 to position four large screws on a clean dry wall surface.

3. Leave the head of each screw 5/16" out from the surface of the wall. Screws must be able to support 15lb.

4. Mount the PowerView display onto the wall by positioning it over the screws, and sliding it down until it is securely in place.

SmartSlot™ Interface Accessories

SmartSlot™ bays at the rear of the frame accomodate up to four accessory cards. *SmartSlot*™ cards are available through the dealer, or by calling APC at 1-888-809-TECH.

Note: *APC has enhanced the SmartSlot™ Accessories to function with Symmetra™. Before installing any SmartSlot™ accessory, make sure it is a new, "Symmetra™ Compatible" model.*

- **Share-UPS™ SmartSlot™ Accessory Card** - Provides automatic shutdown of up to fifteen servers connected to the Power Array.

- **Control-UPS™/400 SmartSlot™ Accessory Card** - Provides power monitoring and shutdown for an AS/400 system.

- **Measure-UPS™ II SmartSlot™ Accessory Card**
  Works in conjuction with PowerNet SNMP and PowerChute Plus software. Provides environmental information such as ambient temperature, and humidity.
  Note: *If installing more than one accessory card, always install the Measure-UPS card in the slot that is all the way to the right.*

- **Call-UPS™ SmartSlot™ Accessory Card**
  Works with an external modem to provide out-fo-band UPS management for the Power Array.

See the *User's Manual* that is included with the *SmartSlot*™ Accessory card for specific installation and operating instructions.

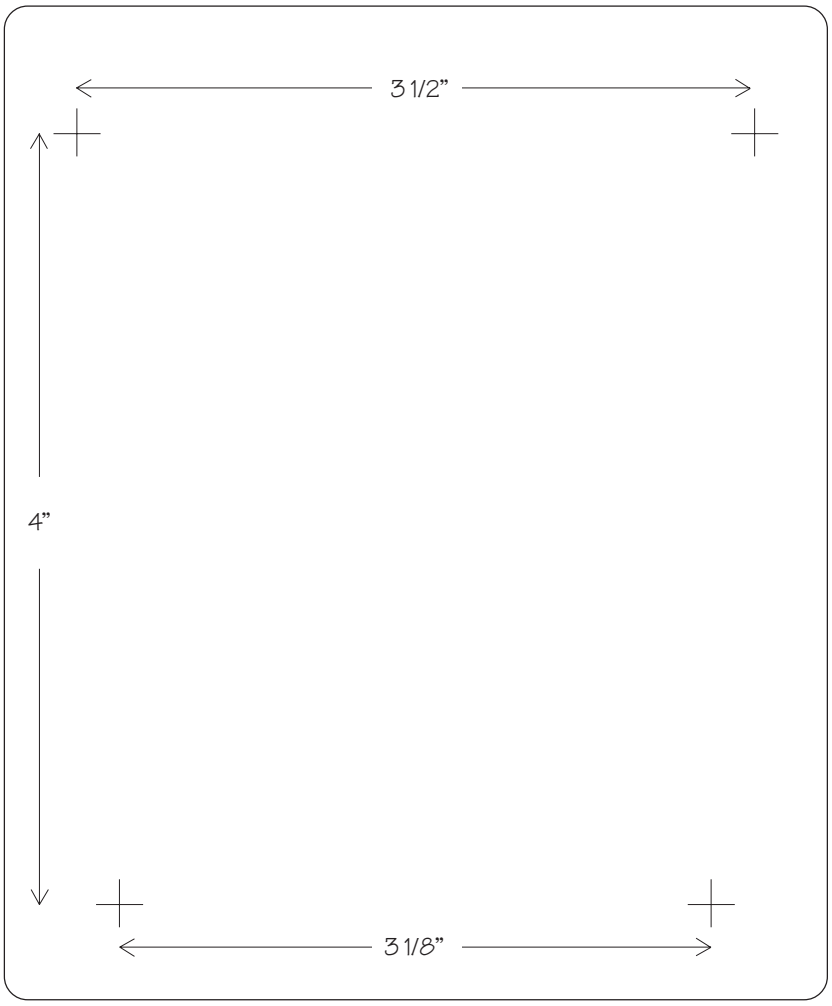


Fig 5-13 *PowerView Wall Mounting Template*

Installation Test

The following test procedure is intended to ensure that the MIM, RIM and the power and battery modules have been correctly installed. It will verify that the Symmetra™ is responding correctly and is ready to deliver power to the load equipment. It is intended that the installer of the Symmetra™ system will perform this test.

Before this test can be conducted, the main intelligence module (MIM), the PowerView display, at least one power module and at least one battery module all must be properly installed. Installation procedures are provided earlier in this chapter.

Note: *This test is intended to verify the correct setup and installation of the Symmetra™ system. It is not intended to explain it's usage. In this procedure, you will be instructed to ignore PowerView messages, etc. Refer to chapters 6 & 7 for detailed information about the operation of Symmetra™.*

Installation Test/Checklist

❑ **1.** Make sure all three switches - system enable, maintenance bypass, and input circuit breaker are in the off or standby position. Make sure all load equipment is either turned off, or is unplugged from Symmetra™.

Note: *Load equipment can be left connected during this test procedure, however power will be switched on and off to the load equipment. Therefore, it is recommended that load equipment be switched to the "off" position, until the completion of this test.*

❑ **2.** Switch both the input circuit breaker and the system enable switch to the "on" position. Symmetra™ will power up internally, but will not deliver output voltage. The PowerView will display text. Depending on the configuration of the Symmetra™, one or more messages such as "Number of Battery Modules has changed" may appear. Press the ESC navigation key until the startup screen appears. See figure 5-14. Verify that the input voltage is 208V or 240V nominal, that the output voltage reads "000Vout," and that all four of the PowerView LED lights are off.

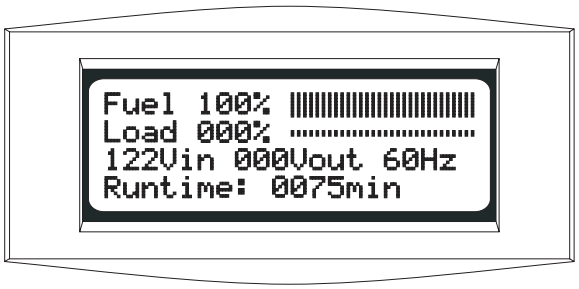


Fig 5-14 Startup Screen

❑ **3.** From the startup screen, press the ESC navigation key to display the top level menu screen. See figure 5-15.

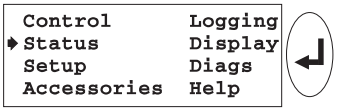


Fig 5-15 Top Level Menu & The Enter Navigation Key

Press the down arrow navigation key to select "Status," and then press the enter navigation key. The voltage status screen appears. See figure 5-16.

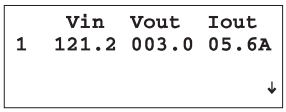


Fig 5-16 Voltage Status Screen

Read the voltge status screen to verify that input voltage (Vin) is nominally either 208V or 240V. Verify that output voltage (Vout) is approximately 0V.

❑ **4.** Press the down arrow key to scroll to the frequency status screen. See figure 5-17. Verfiy that the input frequency is approximately 60 Hz.

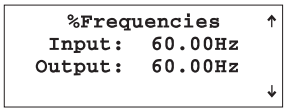


Fig 5-17 Frequency Status Screen

❑ **5.** Press the down arrow key to scroll to the battery status screen. See figure 5-18. Verfiy that the number of battery modules reported (01 in the example below) is the same as the actual number of battery modules that are installed. Verify that the number of "bad" modules reported is zero. Verify that there is a minimum of 90V of battery voltage reported.

Note: *The reported battery voltage will vary from approximately 90V to 148V, depending on the state of the charge. If the reported voltage is less than 90V, allow the battery modules to recharge. (Leave the system enable switch and the input circuit breaker in the "on" position, and allow the Power Array to remain idle for approximately one half hour.)*

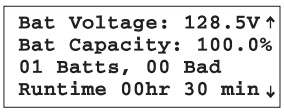


Fig 5-18 Battery Status Screen

❑ **6.** Press the down arrow key to scroll to the power module status screen. See figure 5-19.

```
Capacity: 12.0kVA  ↑
Fault Tolerance: n+2
Total UPS Modules:03
Bad UPS Modules: 00↓
```

Fig 5-19 Power Status Screen

Verfiy that the number of power modules reported (3 in figure 5-19) is the same as the actual number of power modules that are installed. Verify that the number of "bad" modules reported is zero. The first line of the power status screen displays the reported capacity of the Symmetra™. The reported capacity is dependent upon the number of power modules installed, and the size of the frame. Use table 5-1 to confirm that the PowerView is reporting the correct information.

Number of Power Modules	Reported Capacity in MiniFrame	Reported Capacity in MasterFrame
1	4 kVA	4 kVA
2	8 kVA	8 kVA
3	8 kVA	12 kVA
4	n/a	16 kVA
5	n/a	16 kVA

***Table 5-1** Symmetra™ Power Module/Frame Capacities*

❑ **7.** Press the down arrow key to scroll to the miscellaneous status screen. See figure 5-20. The bottom line indicates the status of the MIM and RIM. The sample screen in figure 5-20 indicates that both are installed and functioning properly (OK). If a module is not installed, the status screen will display the word "NONE." Confirm that the status of the MIM and RIM as indicated by this screen conforms to the actual installation of those modules. Use the ESC key to return to the startup screen.

```
Self Tst: None
Lst Xfr: Test
Status: On Line
IM: OK  RIM: OK
```

Fig 5-20 Miscellaneous Status Screen

❑ **8.** Use the following steps to deliver output voltage to the load equipment. See figure 5-21 for the screen sequence.

- Press the ESC navigation key on the PowerView display until the startup screen appears.
- Press the ESC key to display the top level menu.
- Press the down arrow navigation key, until the cursor is pointing to "Control."
- Press the "enter" navigation key.
- Press the down arrow navigation key, until the cursor is pointing to "Turn Load ON."
- Press the "enter" navigation key.
- Confirm that you want to turn the load on, by selecting "YES, Turn UPS ON"
- Several other over-ride messages may appear, depending on the system configuration. Select "start now" for any of these startup over-ride messages.

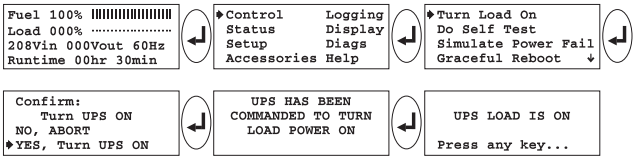


Fig 5-21 Power The Load Sequence

After several seconds, the PowerView display should report that the "UPS LOAD IS ON." Press the ESC key to return to the startup screen. Confirm that output voltage is present, and that the Load On LED is glowing.

***Note:** The Bypass LED may flash on briefly, and the On Battery LED may light for 20-30 seconds if the system is configured for "self test at power on."*

❑ **9.** Perform a self test by following the screen sequence in figure 5-22.

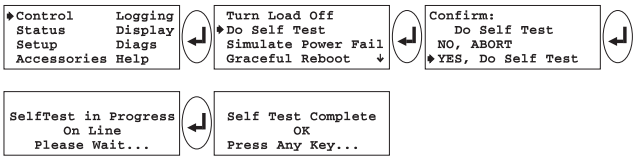


Fig 5-22 Initiate a Self Test Sequence

The On Battery LED should glow for approximately 30 seconds. A message will appear on the display indicating that a self test is in progress. When the "Self Test Complete" message appears, press any key to return to the startup screen.

❑ **10.** Place the Symmetra™ into Bypass by following the screen sequence in figure 5-23.

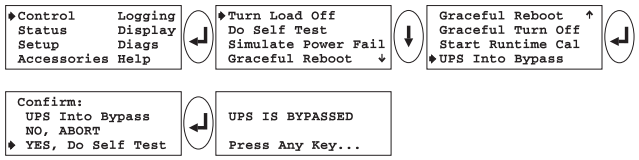


Fig 5-23 Initiate a Self-Test Sequence

The Bypass LED should light, and the PowerView display will indicate that the Symmetra™ is bypassed.

❑ **11.** Return the Symmetra™ to the on-line mode of operation by following the screen sequence in figure 5-24.

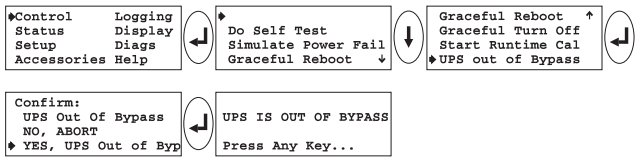


Fig 5-24 Return to On-Line Sequence

The Bypass LED should go out, and the message "UPS IS OUT OF BYPASS" will appear on the PowerView display. Press any key to return to the startup screen.

❑ **12.** Power down the load equipment by following the screen sequence in figure 5-25.

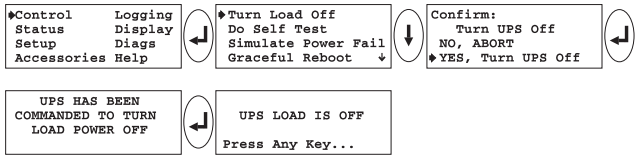


Fig 5-25 Power Down the Load Sequence

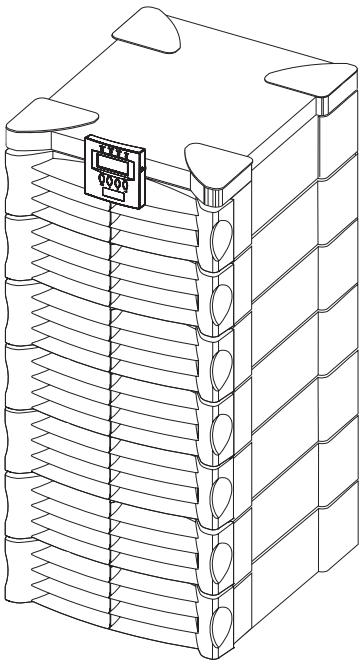
From the Control menu, power down the load equipment by executing the UPS LOAD OFF command. After several seconds, the "UPS LOAD IS OFF" message is displayed. All LEDs on the PowerView should be off.

❑ **13.** Power down the Symmetra™ by switching the system enable switch and the input circuit breaker to the "off" position. The installation procedure has now been completed.

Chapter Six

PowerView Display

The PowerView Display is used to control the Power Array, configure functionality, monitor system components, set alarm thresholds, and to compile and review a log of power events. The Powerview contains the audible and visual alarms that are initiated when an "alarm event" occurs.



The PowerView Display

The PowerView Display is the primary user interface for the Symmetra™ Power Array system. It is used to control the Power Array, to configure the functionality, monitor the system, set alarm thresholds, and it performs as the audible and visual alarm.

Physical Features of the Powerview

The PowerView Display incorporates a 4 x 20 LCD with four navigation keys, four LED lights, and an audible alarm beeper. It is designed to either mount on the front of the frame, to stand on top of the frame, or to be installed at a remote location. A local RJ45 connector cable is hardwired to the top power module bay (L1), and is used to connect the display when it is mounted onto the frame. A 20' RJ45 cable is provided with the system for positioning the PowerView at a remote location.

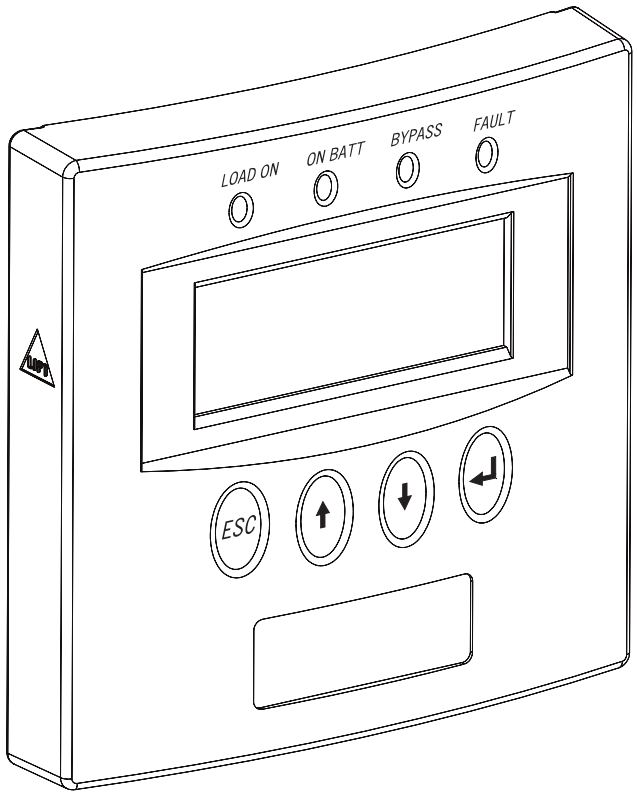


Fig 6-1 The PowerView Interface

PowerView Functions

An overview of each of the PowerView interface functions is provided below:

- **User Interface** - The PowerView is the primary user interface for the system. It is used to command the system to power up, and power down the load, as well as to check the status of system components, and to configure the functionality of the system.

- **Alarms and Alarm Thresholds** - The PowerView contains an audible and visual alarm system. In the event of a power disturbance, or loss of a system component, (and other user-configured alarm conditions), the PowerView interface emits both an audible alarm and displays a visual message.
  As an example, if a Power Array has been configured with an N+1 redundancy, the PowerView can be configured so that an audible alarm will sound if the system looses the redundant power module. (Typically, this would be the result of an additional load being added, or a power module failure.) Other user configurable alarms include load size threshold and minimum runtime threshold. Procedures for setting user configurable parameters are provided in Chapter 7. All PowerView display messages, and the corrective actions are listed in Chapter 9.

- **Set System Function Parameters** - The PowerView can be used to set parameters for the functioning of the Power Array. These include acceptable input and output frequency ranges, frequency of self tests, and minimum/maximum settings for power transfers.

- **Powerview Interface Parameters** - The PowerView can be used to set the contrast of the LCD screen, select the information that is displayed in the startup screen, set the time, date, password and the audible alarm volume.

- **Event Logging** - The last 64 power and user events are recorded and accessible via the PowerView interface. The category of events that are logged is configurable. Statistics are compiled and can be reviewed using the PowerView.

- **Check Status and Diagnostics** - Input voltage, output voltage, available runtime, load size, current operating mode and the status of each power and battery module are reported by the PowerView interface.

- **Testing** - The PowerView interface can be used to perform a system self test and to simulate a power failure.

- **Help Function** - Pressing the up and down navigation keys simultaneously launches context sensitive help.

PowerView LED's

Four LED indicators report the operational status of the Power Array. Table 6-1 describes the function of each of the LED indicators.

LED	Color	Description
LOAD ON	**Green**	Indicates normal, on-line operating condition. The Power Array is on, is receiving power from the utility, and is supplying clean, conditioned power to the load.
ON BATT	**Yellow**	Indicates that a utility power failure has occured, and that power to the attached load is being supplied by the battery modules.
BYPASS	**Yellow**	Indicates that power to the load is being supplied directly from the power utility. The Power Array has been effectively removed from the circuit.
FAULT	**Red**	Indicates that the Power Array has detected an internal fault condition. An alarm message will appear on the PowerView display. (See Chapter 9 for appropriate corrective action.)

Table 6-1 *Power Array Display LEDs*

Navigation Keys

The four navigation keys located on the front of the Powerview interface are used to move through the screen menus, select menu items, and to either access information, or change system parameters. A small arrow at the left side of the display screen indicates which menu item or parameter is selected. The navigation keys are described in Table 6-2.

Table 6-2 *Navigation Keys Descriptions*

The Startup Screen

When the system enable switch is switched to the "on" position, the "Startup Screen" appears. See figure 6-2. This screen is the factory default, and can be user configured to display other information. Note that all PowerView screens will "time out" after ten minutes of inactivity. It reappears when any navigation key is touched. The startup screen displays the following information:

- **Fuel Percentage** - The first line indicates the percentage of battery capacity (fuel) that is currently available.
- **Load Percentage** - The second line indicates the percentage of system capacity that is employed supporting the current load.
- **Voltage and Input Frequency** - The third line indicates the input voltage, output voltage, and the input frequency.
- **Run time** - The fourth line indicates the run time that can be expected, based upon the current load, and battery capacity.

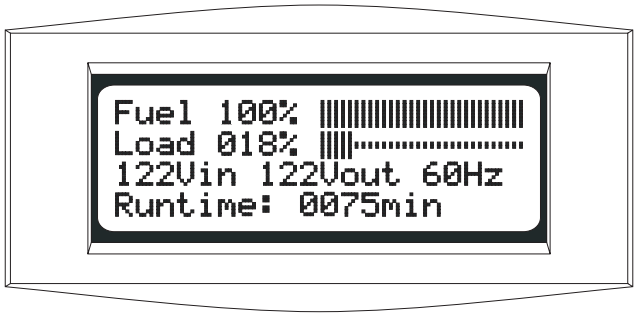


Fig 6-2 Startup Screen

The Top-Level Menu Screen

When the startup screen is displayed, pressing any of the navigation keys opens the "Top-Level Menu" screen. This screen contains seven menu items, and a context sensitive help function. See Figure 6-3.

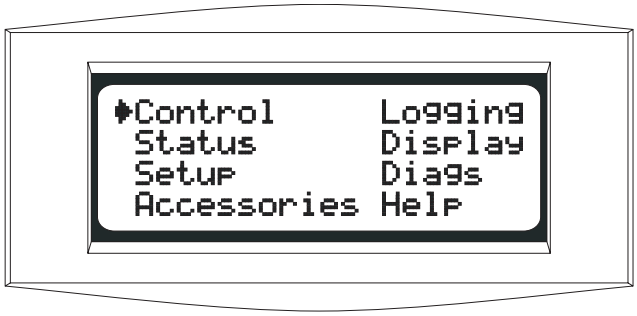


Fig 6-3 Top-Level Menu Screen

The top-level menu screen is analogous to a menu bar at the top of a computer software interface. Selecting any of the seven menu items, and pressing the "enter" key opens a submenu. Menu items and functions are outlined below. In Chapter 7, the PowerView interface is used to power up the load equipment. Many of the following PowerView functions are explained in those procedures.

Control

- Power up and power down the load equipment
- Simulate a power fail
- Graceful reboot
- Graceful turn off
- Start run time calibration
- Put system into or out of bypass mode

Status

- Determine input/output voltage and frequency
- Determine the % load - no redundancy
- Determine the % load - with redundancy
- Review input/output frequencies
- Review status of battery modules
- Review status of power modules
- Review alarm thresholds
- Determine current operation mode,
- Review status of the main intelligence module
- Review status of the redundant intelligence module

Setup

- Set the system shutdown parameters
- Set the alarm thresholds
- Set input/output frequency sync range
- Set system to either go, or not go to bypass if frequency sync is out of range when a power module failure occurs
- Set "self test at power up" on or off
- Set system ID
- Set output voltage
- Copy system settings

Accessories

- Monitors *SmartSlot*™ Accessory cards (if present)

Logging

- View the last 64 power or user events
- Select which events are to be recorded in the event log
- Clear event log
- View statistical representation of log data
- View events by the individual groups that are being logged

Display

- Configure the date and time
- Set a password
- Display the "about system" information
- Set audible alarm parameters and volumes
  Note: *This function is used to switch off the beeper alarm.*
- Set screen contrast
- Configure the startup screen

Diagnostics

- Display the reason a failure, change or alarm has occurred
- Check the Intelligence Module
- Check the Redundant Intelligence Module
- Check the UPS modules
- Check the Battery modules

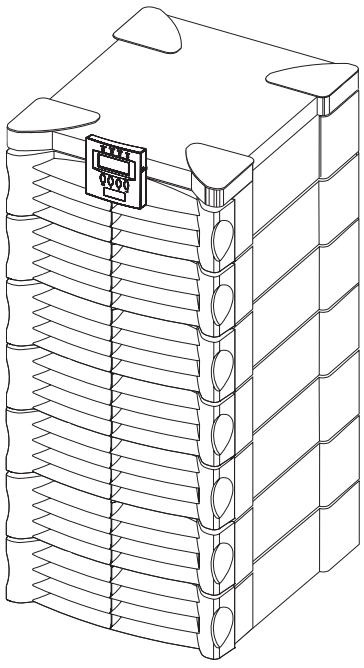
Help

- Provides context sensitive help

Chapter Seven

Configuring & Operating the Symmetra™

This chapter includes the procedures to use the PowerView to configure the system, and to initiate delivery of conditioned power to the load equipment. You will use the PowerView interface to set the configuration variables and alarm thresholds, and to review the status of the components of the system. Also included is the procedure for reviewing the power and user events log.



Introduction

The following pages comprise the inital configuration of the Symmetra™ system. Read and follow these steps carefully. When they are completed, the Power Array system will be configured to provide optimal power protection for the data center, or other load equipment.

The following procedures assume that the Power Array system is not yet powered. If the Power Array is already powered, check to make sure the loads are in a safe state to be switched off, and then switch the load equipment off. Switch the system enable switch and the input circuit breaker to the "stand by" position. Switch the maintenance bypass to the "off" position.

Note: *Refer to chapter 1 for the location of the switches.*

Step 1: Powering the Power Array

In this step the Power Array is powered, while the loads remain unpowered.

1. Make sure all input, output and EPO wiring has been installed by a licenced electrican. Check to insure that the electrican has completed the electrical wiring test/checklist at the end of chapter 4. Make sure all modules and the PowerView are installed correctly, and that all front grill covers have been replaced onto the frame.

2. Switch the input circuit breaker to the "on" position. The Power Array is now connected to utility voltage.

3. Switch the system enable switch to the "on" position. The startup screen will appear on the display.

Note: *When the system enable switch is switched to the "on" position, the Power Array runs through a series of internal tests. Allow the Power Array to start up for a minimum of 10 seconds, before entering commands into the PowerView interface.*

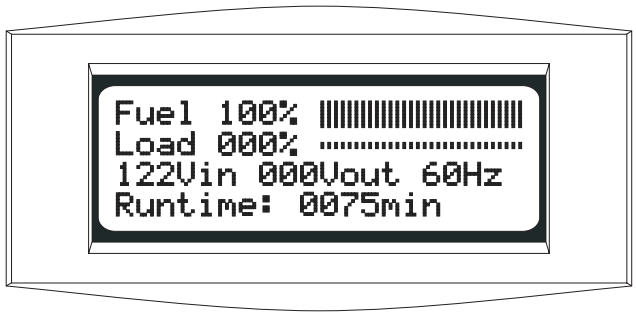


Fig 7-1 *Startup Screen*

4. The first line of the startup screen displays the battery capacity.* The second line displays the load capacity. This displays 000% because the load is not powered yet. The third line displays the input and output voltage, and the input frequency. Again, the output voltage should read "000Vout" because the load has not been powered. The fourth line displays the predicted run time for the current load. Until the load is powered, this run time will not be meaningful.

** Under ideal conditions, the batteries would be at 100% capacity. Typically, there will be some battery discharge during handling and shipping of the Power Array. If batteries are showing less than 50% capacity, allow the batteries to charge before proceeding. (Leave the system enable switch and the input circuit breaker in the "on" position.)*

Step 2: Powering the Loads

1. Use the sequence in figure 7-2 on the PowerView interface to enter the "Turn Load On" command.

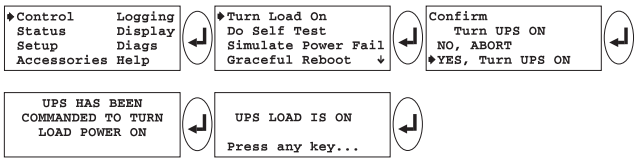


Fig 7-2 "Turn Load On" Command Sequence

2. The Power Array has now been instructed to power up the load equipment. It conducts a self diagnosis, and determines if the conditions are appropriate to power the load. Depending on the diagnostics, the Power Array will either power the load, or one of several startup over-ride messages will appear. A startup over-ride message indicates an exceptional condition exists, and gives the option to proceed or abort. An example startup over-ride message is displayed below:

```
#Pwr modules changed
since last on
♦start now
abort startup
```

Fig 7-3 Sample Startup Over-Ride Message

For this initial sequence, select "start now" for any startup over-ride message that may appear.

Note: *If an alarm sounds, and a "fault message" appears, see chapter 9 for the cause, and the corrective action.*

3. When the load has been successfully powered, the green "LOAD ON" LED will glow, and the message "UPS LOAD IS ON" will appear on the screen.

Note: *The yellow "ON BATT" LED will glow momentarily, while the system is conducting the self test.*

4. Press the Escape key and return to the startup screen.

Note: *The output voltage now registers on the display, and the load percentage and run time are now based on the actual load.*

Step 3: Review Status Conditions

In this step, the status conditions of the Power Array are accessed with the PowerView. Status information is used as "reference" information about the condition of the Power Array, and the modular components. Review the following status screens for content. Status information is accessed via the "Status" menu item on the top level menu.

Position the arrow cursor next to the "Status" menu item on the top level menu screen. Press enter. The voltage status screen appears.

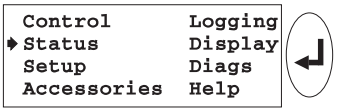


Fig 7-4 Opening the Status Menu Item

Voltage Status Screen

```
     Vin  Vout  Iout
1  121.2 120.0 05.6A
```

Fig 7-5 Voltage Status Screen

The voltage status screen displays the following information:

Input Voltage - the actual input voltage from the utility source.

Output Voltage - the actual output voltage.

Load Current - the amperage drawn by the load.

After the voltage status screen has been reviewed, press the enter key. The load with redundancy status screen appears.

% Load With No Redundancy Status Screen

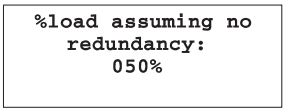


Fig 7-6 Percent Load With No Redundancy Status Screen

% Load Assuming No Redundancy - displays the percent of the total Power Array capacity that is required by the load. The total Power Array capacity is defined by the number of power modules installed, multiplied by 4kVA and is limited by the kVA rating of the frame. See table 7-2. After this screen has been reviewed, press the enter key. The percent load with redundancy status screen appears.

% Load With Redundancy Status Screen

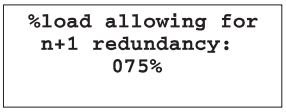


Fig 7-7 Percent Load With Redundancy Status Screen

% Load Allowing For Redundancy - displays the percent of the non-redundant Power Array capacity that is required by the load. The non-redundant Power Array capacity is defined by the number of *user defined* non-redundant power modules installed, multiplied by 4kVA and is limited by the kVA rating of the frame. See table 7-1. After the load with redundancy status screen has been reviewed, press enter. The frequency status screen appears.

Note: *The redundancy level for this measurement is user defined, and will be assigned in Step 6 of this procedure. Either zero, one or two power modules will be designated as "redundant." The remaining power modules are then defined as "non-redundant."*

Frequency Status Screen

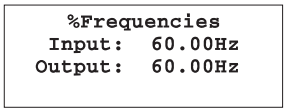


Fig 7-8 Frequency Status Screen

Frequencies - displays the input frequency that is being received from the utility power source, and the output frequency being delivered to the load equipment. After the frequency status screen has been reviewed, press enter. The battery status screen appears.

Battery Status Screen

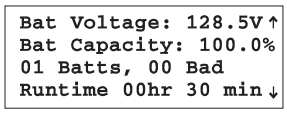


Fig 7-9 Battery Status Screen

Battery Status Screen - displays battery voltage, the percentage of available battery capacity, number of battery modules that are installed, number of battery modules that are "bad" and the predicted run time. Use this screen to check the status of the battery modules. After the battery status screen has been reviewed, press enter. The power status screen appears.

Note: *If a battery module is diagnosed as "bad," see chapter 8.*

Power Status Screen

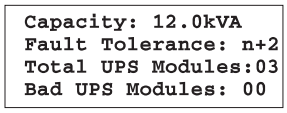


Fig 7-10 Sample Power Status Screen

Power Status Screen - the reported Power Array capacity is dependent upon the number of power modules installed, and the size of the frame. Use table 7-2 to confirm that the PowerView is reporting the correct information.

Table 7-1 Non-Redundant Power Array Capacities

Table 7-2 Symmetra™ Power Module/Frame Capacities

The power status screen also displays the *actual* level of fault tolerance, the number of power modules in the frame, and the number of "bad" power modules. The actual fault tolerance indicates the number of functioning power modules in the Power Array, minus the number required to power the load. (i.e., If a load is 6kVA, two modules are required. If there are five modules installed, the fault tolerance would read N+3.) Use this screen to check the status of the power modules. After this screen has been reviewed, press enter. The alarm threshold status screen appears.

Note: *If a power module is diagnosed as "bad," see chapter 8.*

Alarm Threshold Status Screen

```
 Alarm Thresholds  ↑
Fault Tolerance: n+1
Load: 10.0 kVA
Runtime: 00hr 15min↓
```

Fig 7-11 *Sample Alarm Threshold Status Screen*

Alarm Thresholds - The alarm threshold status screen displays the user-defined fault tolerance threshold. An audible alarm will sound if the level of redundancy drops below this level. This screen also displays a user specified load threshold. An audible alarm will sound if the attached load exceeds this threshold. Finally, the run time alarm threshold is displayed. An audible alarm will sound if the predicted run time becomes less than this threshold (either because of loss of battery capacity, or increased load). After the alarm threshold status screen has been reviewed, press enter. The miscellaneous status screen appears.

Note: *Alarm thresholds will be set in Step 4.*

Miscellaneous Status Screen

```
Self Tst: None
Lst Xfr: Test
Status: On Line
IM: OK  RIM: OK
```

Fig 7-12 *Sample Miscellaneous Status Screen*

The Miscellaneous Status Screen - displays the following information:

Self Test - the results of the last self test perfomed by the Power Array.

Last transfer - displays the reason for the last transfer to battery.

Status - identifies the current mode of operation.

Note: *See the "Introduction" for details about operating modes.*

IM - displays the status of the main intelligence module.

RIM - displays status of the redundant intelligence module.

The miscellaneous status screen is the final status screen. Press the Escape key to return to the startup screen.

Step 4: Perform a Self Test

A Power Array self test measures system performance by sequentially placing each power module on battery, and then briefly placing all of the power modules on battery.

1. The following sequence on the PowerView will initiate a system self test:

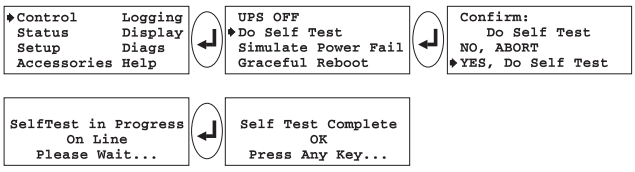


Fig 7-13 *Initiate a Self Test Sequence*

2. The PowerView displays the message "Self Test In Progress" while the Power Array system performs the test.

Note: *The Power Array will make a series of clicking sounds during a self test.*

3. The PowerView will either report that the self test was completed with no errors, or will report any failures detected.

4. Press the escape key and return to the startup screen.

Step 5: Configure Shutdown Parameters

Specific shutdown parameters can be configured into the PowerView. Follow this procedure to configure the shutdown parameters that best fit best fit the data center requirements.

The following sequence on the PowerView opens the shutdown parameter selection screen:

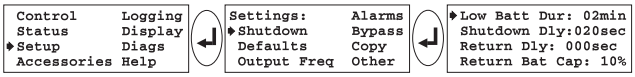


Fig 7-14 Shutdown Parameter Selection Sequence

Shutdown Parameter Selection Screen

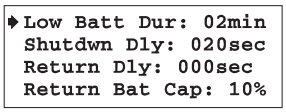


Fig 7-15 Shutdown Parameter Selection Screen

Each line of the shutdown parameter selection screen contains a configuration parameter. To set a parameter, select a line and press the enter key. Note the flashing up/down arrow appears. Select the desired parameter by scrolling up or down through the choices using the arrow navigation keys. When the desired parameter is displayed, press the enter key. The parameter is then recorded into the PowerView memory.

Line #1: Low Battery Duration - When in the on battery mode, the Power Array will signal an alarm 2, 5, 7 or 10 minutes before system shutdown occurs due to battery exhaustion. Make selection based on the time required to gracefully shutdown the load equipment in the data center.

Line #2: Shutdown Delay - many computer networks that issue shutdown commands will require some additional run time after that command is issued to gracefully shut themselves down. If your computer network is one of these, the Power Array provides a choice of a 20, 180, 300 or 600 second delay from the receipt of the shutdown command, to when the Power Array stops powering the load equipment.

Line #3: Return Delay - when utility power is restored after a failure, a delay interval may be desirable, to allow utility power to stabilize before the system goes back on line. The return delay interval can be set to 0, 60, 180 or 300 seconds.

Line #4: Return Battery Capacity - When returning from an extended power failure, a minimum battery capacity is often desired before repowering the load. The settable values for this paramer are 0, 10, 25 and 90%. This minimal requirement insures there will be sufficient battery run time to safely shutdown the load in the event of a subsequent power failure. Press the enter key to record your selection, and then press escape to return to the startup screen.

Step 6: Configure Alarms

Specific alarm parameters can be configured into the PowerView. Follow this procedure to set the alarm thresholds that best fit the data center requirements.

Use the following sequence on the PowerView to open the alarm thresholds selection screen:

Fig 7-16 Opening the Alarm Thresholds Selection Screen

Alarm Thresholds Selection Screen

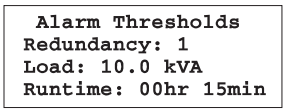


Fig 7-17 Alarm Threshold Selection Screen

Each line of the alarm threshold selection screen contains a configuration parameter. To set a parameter, select a line and press the enter key. Note the flashing up/down arrow appears. Select a desired alarm parameter by scrolling up or down through the choices using the arrow navigation keys. When the desired parameter is displayed, press the enter key. The parameter is then recorded into the PowerView memory.

Line #1: Redundancy Alarm Threshold - The Power Array will signal an alarm if redundancy falls below this threshold. Base this selection on the number of power modules present (4kVA each), the size of the load, and the power module redundancy requirements. If redundant power modules are installed, it is highly recommended that this threshold be set so that the alarm will be initiated if the redundancy is lost. (Possibly as a result of an unauthorized increase of the load.)

Line #2: Maximum Load Threshold - The maximum load threshold can be set, in increments of 2kVA. If the load exceeds this threshold, the alarm will sound.

Line #3: Minimum Run Time Threshold - The minimum available run time threshold can be set. In the event that the predicted run time falls below this threshold, the alarm will sound.

Switching Audible Alarm Beeper Off

Use the following sequence to access the beeper alarm on/off command: "Top level menu-Display-Beeper-Vol-select off."

Note: *This silences the audible alarm. It does not resolve the alarm situation.*

Step 7: Review Diagnostic Information

The PowerView allows the user to access an extensive set of self-diagnostics information. Follow this procedure to review the diagnostic screens.

The following sequence on the PowerView opens the diagnostics menu screen:

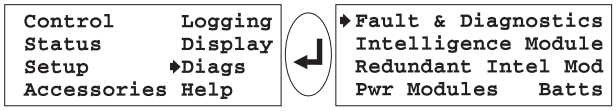


Fig 7-18 Opening the Diagnostics Menu Screen

Diagnostics Menu Screen

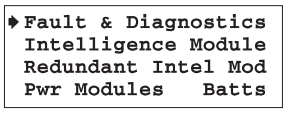


Fig 7-19 Diagnostics Menu Screen

Each line of the diagnostics menu screen contains a menu selection item. Each of these open subsequent screens as shown below.

Line #1: Fault & Diagnostics Menu Item - This screen provides an overview of any faults detected within the system. If a fault is detected, the PowerView will specify which type of system component has failed.

Line #2: Intelligence Module Diagnostic Menu Item - This menu item opens the main intelligence module information screen.

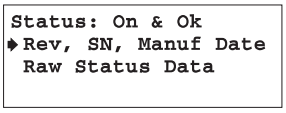


Fig 7-20 Intelligence Module Information Screen

The status line at the top of this screen indicates if the main intelligence module is functioning properly or not. This screen also provides detailed information about the MIM.

Line #3: Redundant Intelligence Module Diagnostic Menu Item - This screen opens the redundant intelligence module information screen. It appears the same as figure 7-20.

Line #4 (left): Power Module Diagnostic Menu Item - This menu item opens the power module information screen.

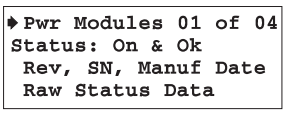


Fig 7-21 Power Module Information Screen

With the flashing arrow cursor pointing at the first line (as illustrated in figure 7-21), press the enter key. Note the flashing up/down arrow appears. Use the arrow navigation keys to scroll up or down. The status of each module will appear one at a time. In the event of a power module failure, use this screen to identify which power module has failed. Use this screen to confirm that a new module is recognized by the Power Array, and is functioning properly. (Procedure in chapter 8.)

Line #4 (right): Battery Diagnostic Menu Item - This menu item opens the battery module information screen.

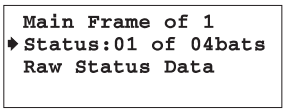


Fig 7-22 Battery Module Information Screen

With the flashing arrow cursor pointing at the second line (as illustrated in figure 7-22), press the enter key. Note the flashing up/down arrow appears. The status screen for the battery module in the top battery module bay appears:

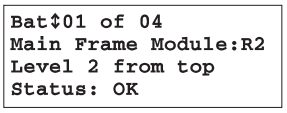


Fig 7-23 Top Battery Module Status Screen

This screen indicates that the battery module in bay "R2" is functioning properly. Use the arrow navigation keys to scroll through all of the battery module status screens. In the event of a battery module failure, use this screen to identify the battery module that has failed. After a battery module is replaced, confirm the new module is recognized by the Power Array, and is functioning properly. (Procedure in chapter 8.)

Step 8: Review Logging Menu

The PowerView records the most recent 64 user or power events in an electronic log.

The following screen sequence opens the event log screen:

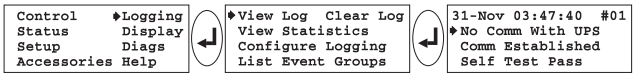


Fig 7-24 Open the Event Log Sequence

Event Log Screen

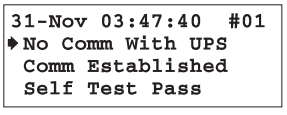


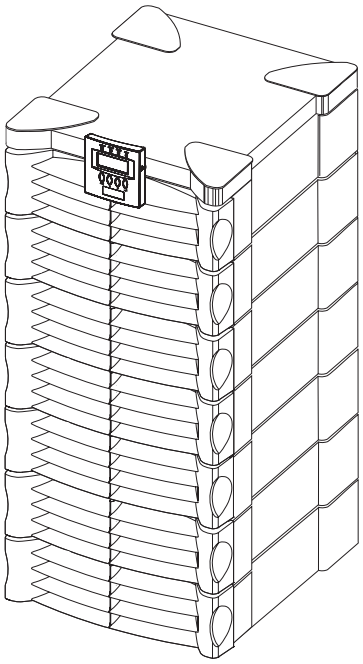
Fig 7-25 Event Log Screen

Scroll up or down through the log items using the arrow navigation keys. The time, date and the number of the selcted log item is displayed on the top line. For more information about a log item, select it, and press the enter key.

Chapter Eight

Module Replacement

The modular components of the Power Array are user replaceable. This chapter provides the procedures for identifying and replacing a failed module, and for verifying that the new module is installed and functioning properly. A toll-free telephone number is provided that can be used to contact APC for replacement modules.



Module Replacement

The battery modules, power modules, intelligence module and the redudant intelligence module are user replaceable. If any module fails, and is protected with at least one functioning "redundant" module, it can be "hot-swapped," meaning the failed module can be replaced without interrupting power to the load equipment.

This chapter explains the alarms that indicate a module failure, it provides a toll-free telephone number for technical support and for ordering replacement modules, and it provides the procedure for replacing a failed module.

Module Failure Alarm Indicators

In the event of a module failure, the PowerView will display one of the following four module failure messages. See figures 8-1 through 8-4. In addition to the message, the red *Fault* LED status indicator will glow. Depending on the system configuration, other alarms, including the PowerView audible alarm, a pager notification, and software notification will be issued.

```
Bad Battery Module
Main Frame Module:R5
Level 5 from top
Press any key...
```

Fig 8-1 *Battery Module Failure Message*

```
Bad Power Module
Module:L1
Top Level
Press any key...
```

Fig 8-2 *Power Module Failure Message*

```
Intelligence Module
is installed
and failed
Press any key...
```

Fig 8-3 *Intelligence Module Failure Message*

```
Rednt. Intell. Module
is installed
and failed
Press any key...
```

Fig 8-4 *Redundant Intelligence Module Failure Message*

Each screen clearly identifies which module has failed, and where to find the module in the Symmetra™. These locations match the labels on the center spine behind the grill covers. The PowerView may display additional screens in the form of a "fault list." Press any key to scroll through this fault list. Record the information on each screen. This information will aid in the technical diagnosis of the problem.

Technical Support and Obtaining a Replacement Module

To obtain a replacement module, or for technical assistance, contact APC technical support at 1-888-809-TECH. A technician can help diagnose the situation over the telephone, and can facilitate obtaining a replacement module.* When contacting APC, be prepared with the following information:

- *If possible, contact technical support from a telephone that is within reach of the Symmetra™ PowerView. This will aid in using the display to gather and report additional information to the technician.*
- *Be prepared to provide a detailed description of the problem. A technician will help you solve the problem over the phone if possible, or will give you a Return Material Authorizaton Number (RMA#). This RMA# must be clearly printed on the outside of the package if the module is returned to APC.*
- *If the Symmetra™ is within the warranty period, repairs will be performed free of charge. If it is not within the warranty period, there will be a charge for repair.*
- *If the Symmetra™ is covered by an APC PowerPlan Service Product, have that information available to give to the technical support technician.*

Returning Modules to APC

To return a failed module to APC, pack the module in the original shipping container, and return it by insured, prepaid carrier to the address on the rear cover of this *User's Manual.* If you no longer have the original shiping materials, ask the technician about obtaining a new set. It is very important that you pack the module properly to avoid damage in transit. Never use stryrofoam beads for packaging a module because the module will settle in transit and become damaged. Damages sustained in transit are not covered under warranty. Enclose a letter in the package with your name, RMA#, address, a copy of the sales receipt, description of the trouble, a phone number, and a check (if necessary.)

*If a service contract was purchased from another service provider, contact the service provider for replacement modules, and technical assistance.

Battery Module Replacement

The following section provides the procedure for replacing a battery module.

Removing a Battery Module

⚠ Caution!

- *The battery module weighs approx. 60 lbs. Two people are required to lift and handle a battery module.*

1. Remove the grill cover from in front of the module to be replaced. Note that the module bays are labeled to correspond with the PowerView.

2. Battery modules are designed with a "drop lock" that holds them securely in the Power Array frame. Slightly lift the front handle of the battery module, and pull it forward to the safety stop.

3. With one person on either side of the battery module, assume the full weight of the module.

4. The safety stop retaining flange passes through the notch in the frame as the battery module is removed. See figure 8-5.

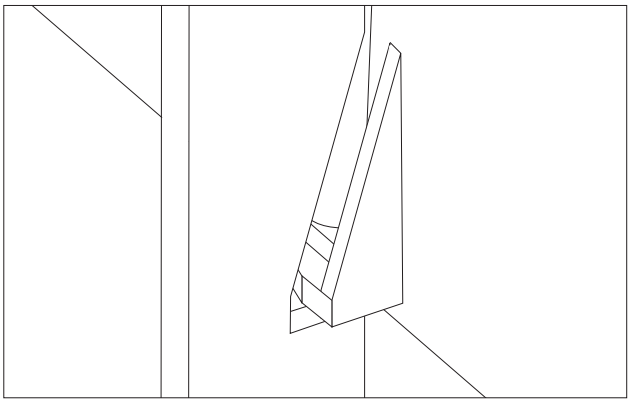


Fig 8-5 *Battery Module Retaining Flange*

5. If the module has failed and needs to be disposed of, return it to the appropriate service provider, or directly to APC for recycyling.

Note: *The Battery Module contains sealed, non-spillable lead acid batteries. These must be recycled or disposed of properly.*

Installing the Replacement Module

Refer to chapter 5 for the battery module installation procedure.

Replacement Battery Module Verification

From the startup screen, press any key to open the top level menu screen. Follow the sequence in figure 8-6 to insure that the new battery module is recognized by the Power Array system, and is functioning properly. (Status: OK).

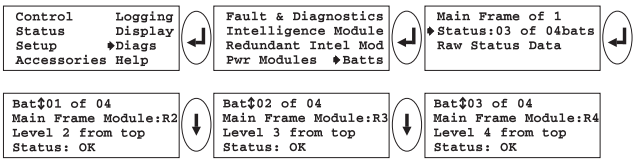


Fig 8-6 *Replacement Battery Module Verification*

Power Module Replacement

The following section provides the procedure for replacing a power module.

Removing the Power Module

1. Remove the grill cover from in front of the module to be replaced. Note that the module bays are labelled to correspond with the PowerView display.

2. If replacing a non-redundant power module, or if the power module to be replaced is the only power module present, the Symmetra™ must be placed in manual bypass mode, or the load equipment must be switched off. To place the Symmetra™ in manual bypass, switch the maintenance bypass switch to the "on" position.

Note: *When the Symmetra™ is in bypass mode, the load equipment is unprotected from power failure.*

3. Use a flathead screwdriver to release the fliplatch from the power module. See figure 8-7.

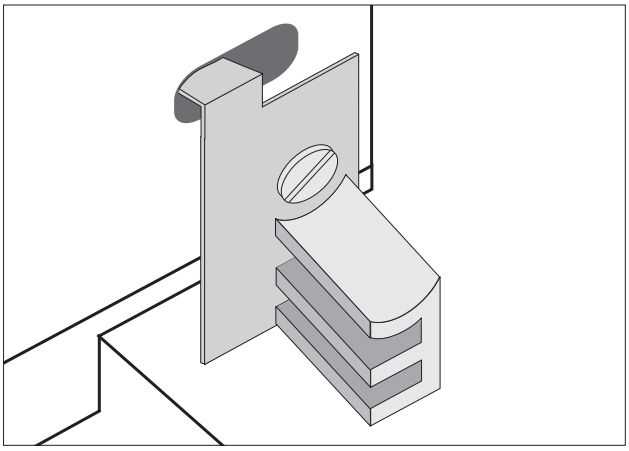


Fig 8-7 *Release the Flip Latch*

4. Note the two drop lock seating tabs at the front of the power module. See Figure 8-8. These are designed to hold the module firmly in the Power Array frame. When removing a failed power module, lift the front of the module slightly to release the drop lock seating tabs, and then pull the module from the bay.

5. Remove the power module from the frame. If the module has failed and needs to be disposed of, return it to the appropriate service provider, or directly to APC.

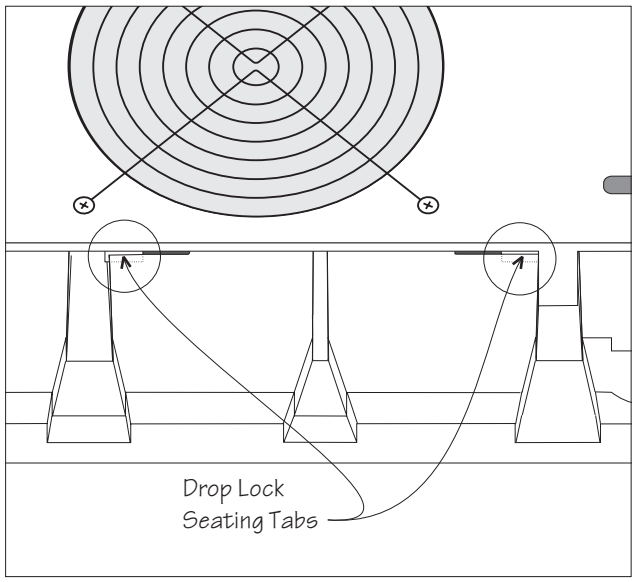


Fig 8-8 *Drop Lock Seating Tabs*

Installing the Replacement Module

Refer to chapter 5 for the power module installation procedure.

Note: *If Symmetra™ was placed in manual bypass in step 2 above, return to normal operation by switching the maintenance bypass switch back to the "off" position.*

Replacement Module Verification

From the startup screen, press any key to open the top level menu screen. Follow the sequence in figure 8-9 to insure that the new module is functioning properly. Note that the up/down cursor appears, and the information for each power module is reviewed by pressing the up or down navigation key. Make sure all power modules display a status of "On & OK."

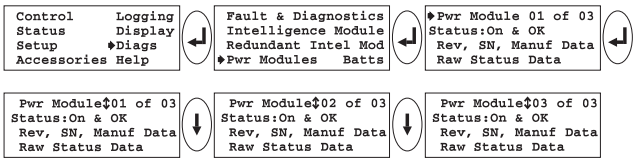


Fig 8-9 *Power Module Verification*

Main Intelligence Module Replacement

The following section provides the procedure for replacing the main intelligence module.

Removing the Main Intelligence Module

1. Remove the grill cover from the top level of the Power Array.

Note: *The intelligence module resides under the redundant intelligence module, in the upper right corner of the frame.*

2. If a functioning RIM is not installed, the Symmetra™ must be placed in manual bypass mode, or the load equipment must be switched off. To place the Symmetra™ in manual bypass, switch the maintenance bypass switch to the "on" position.

Note: *When the Symmetra™ is in bypass mode, the load equipment is unprotected from power failure.*

3. If a functioning RIM is installed, it will provide limited control of the Symmetra™ until the replacement MIM is installed.

4. Use a flathead screwdriver to release the fliplatch.

5. Unscrew and release the retaining screws.

6. Slide the MIM out of the frame.

Installing the Replacement Main Intelligence Module

Refer to chapter 5 for the MIM installation procedure.

Note: *If Symmetra™ was placed in manual bypass in step 2 above, return to normal operation by switching the maintenance bypass switch back to the "off" position.*

Replacement MIM Verification

From the startup screen, press any key to open the top level menu screen. Follow the sequence in figure 8-10 to insure that the replacement MIM is functioning properly. (Status: On & OK).

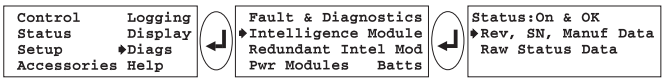


Fig 8-10 *Intelligence Module Verification*

Redundant Intelligence Module Replacement

The following section provides the procedure for replacing the redundant intelligence module.

Removing the Redundant Intelligence Module

1. Remove the grill cover from the top level of the Power Array.

Note: *The redundant intelligence module resides above the intelligence module, in the upper right corner of the frame.*

2. A RIM can only be replaced if a functioning MIM is installed, or the load equipment is switched off.

3. Use a flathead screwdriver to release the fliplatch.

4. Unscrew and release the retaining screws.

5. Slide the RIM out of the frame.

Installing the Replacement Redundant Intelligence Module

Refer to chapter 5 for the RIM installation procedure.

Note: *A RIM alone is not adequate to restart the Symmetra™.*

Replacement Redundant Intelligene Module Verification

From the startup screen, press any key to open the top level menu screen. Follow the sequence in figure 8-11 to insure that the replacement RIM is functioning properly. (Status: On & OK).

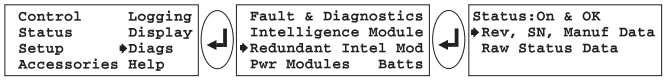
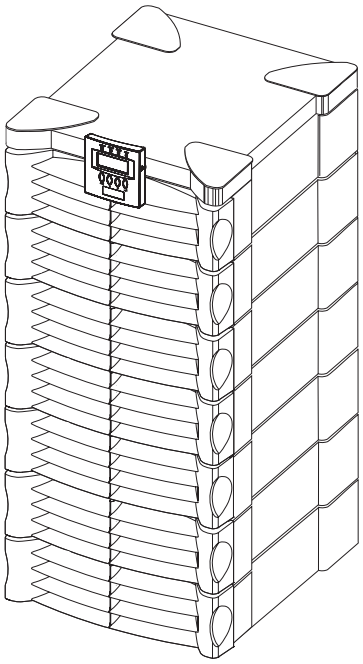


Fig 8-11 *Redundant Intelligence Module Verification*

Chapter Nine

PowerView Display Messages

As the Symmetra™ monitors the system, it reports various messages on the display, including alarm status, changes in system configuration, etc. This chapter provides a list of these messages and what each of them means. It provides the appropriate corrective action for each of the messages. Note that more than one of these messages may occur at one time. If this occurs, review all of the messages for a better understanding of the system condition.



	PowerView Message	Meaning	Corrective Action
Start-Up	#Pwr modules changed since last ON.	At least one power module has been added, or removed from the Symmetra™ since the last time the Pwr ON command was issued.	No corrective action necessary. Proceed with the startup.
	#Batteries changed since last ON.	At least one battery module has been added, or removed from the Symmetra™ since the last time the Pwr ON command was issued.	No corrective action necessary. Proceed with the startup.
	No Redundant Intelligence Module.	There is no RIM installed.	Proceed with the startup, or abort the startup, and install a RIM. **Note:** Without a functioning RIM, there is no redundancy in the event of a MIM failure.
	Batt capacity less than Return Batt Cap	The battery capacity of the Symmetra™ is less than the user specified minimum battery capacity required to turn on the load.	**Option #1**: Abort the startup, and allow batteries to recharge. **Option #2**: Continue startup, with less than minimum battery capacity.
	Input Freq outside configured range	The input frequency to the Symmetra™ is outside the configured range. The output frequency will not synchronize with the input frequency. Normal bypass is not available.	**Option #1**: Improve the frequency of the incoming voltage. **Option #2**: Widen the range of the acceptable incoming frequency with the PowerView. (Startup-Setup-OutputFreq-Select.) **Option #3**: Proceed with startup. Normal bypass is not available.
	AC adequate for UPS but not for bypass	The Symmetra™ will function online with the input voltage, but in the event that bypass is required, the input voltage is not adequate to power the load equipment.	**Option #1**: Improve the incoming voltage. **Option #2**: Proceed with startup. Normal bypass is not available.
	Low/No AC input, startup on battery	Input voltage is not adequate to start the Symmetra™. If startup proceeds, Symmetra™ will function from battery.	**Option #1**: Abort startup until acceptable input voltage is present. **Option #2**: Proceed with startup. Battery will be discharged.

	PowerView Message	Meaning	Corrective Action
General Status	# of batteries increased.	At least one battery module has been added to the system.	No corrective action necessary.
	# of batteries decreased.	At least one battery module has been removed from the system.	No corrective action necessary.
	# of Pwr Modules increased.	At least one power module has been added to the system.	No corrective action necessary.
	# of Pwr Modules decreased.	At least one power module has been removed from the system.	No corrective action necessary.
	Intelligence Module inserted.	A MIM has been installed into the Symmetra™ .	No corrective action necessary.
	Intelligence Module removed	A MIM has been removed from the Symmetra™ .	No corrective action necessary.
	Redundant Intelligence Module inserted.	A RIM has been installed into the Symmetra™ .	No corrective action necessary.
	Redundant Intelligemce Module removed.	A RIM has been removed from the Symmetra™ .	No corrective action necessary.
	# of External Battery Cabinets increased.	At least one external battery cabinet has been connected to the frame.	No corrective action necessary.
	# of External Battery Cabinets decreased.	At least one external battery cabinets has been disconnected from the Symmetra™.	No corrective action necessary.
	Redundancy Restored	A loss of power module redundancy occurred, and has been restored. Either additional modules have been installed, or the load has been reduced.	No corrective action necessary.
	Load is No Longer above Alarm Threshold	The load had exceeded the load alarm threshold. The situation has been corrected either because the load decreased, or the threshold was increased.	No corrective action necessary.
	Min Runtime restored.	The system runtime had dropped below the configured minimum, and has been restored. Either additional battery modules were installed, the existing battery modules recharged, the load was reduced, or the threshold was raised.	No corrective action necessary.

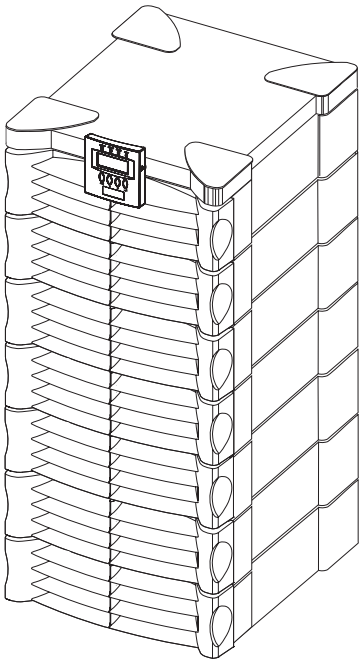
	PowerView Message	Meaning	Corrective Action
Module Failure	Bad Battery Module	A battery module has failed, and requires replacement.	Refer to chapter 8 for module replacement procedure.
	Bad Power Module	A power module has failed, and requires replacement.	Refer to chapter 8 for module replacement procedure.
	Intelligence Module is installed and failed	The main intelligence module has failed, and requires replacement.	Refer to chapter 8 for module replacement procedure.
	Redundant Intelligence Module is installed and failed	The redundant intelligence module has failed, and requires replacement.	Refer to chapter 8 for module replacement procedure.
Threshol-d Alarm	Load is above kVA alarm threshold	The load has exceeded the user specified load alarm threshold.	**Option #1**: Reduce the load. **Option #2**: Use the PowerView to raise the alarm threshold.
	Redundancy has been lost.	Symmetra™ no longer detects redundant power modules. Either power module(s) have failed, or the load has increased.	**Option #1**: If possible, install additional power modules. **Option #2**: Decrease the load. **Option #3**: Disable the redundancy alarm by setting redundancy to zero. (Startup-Setup-Alarms-Redundancy-select zero.)
	Redundancy is below alarm threshold.	Actual power module redundancy has fallen below the user specified redundancy alarm threshold. Either power module(s) have failed, or the load has increased.	**Option #1**: If possible, install additional power modules. **Option #2**: Decrease the load. **Option #3**: Use the PowerView to decrease the redundancy alarm threshold. (Startup-Setup-Alarms-Redundancy-select.)
	Runtime is below alarm threshold.	The predicted runtime is lower than the user specified minimum runtime alarm threshold. Either the battery capacity has decreased, or the load has increased.	**Option #1**: Allow the battery modules to recharge. **Option #2**: If possible, increase the number of battery modules. **Option #3**: Decrease the load. **Option #4**: Use the PowerView to decrease the minimum runtime alarm threshold. (Startup-Setup-Alarms-Runtime-select.)
Bypass	Bypass is not in range (either freq or voltage)	The frequency and/or voltage is out of acceptable range for bypass. This message occurs when Symmetra™ is on line, and indicates that the bypass mode may not be available if required.	**Option #1**: Decrease the sensitivity to input frequency. (Startup-Setup-OutputFreq-select.) **Option #2**: Corrrect input voltage to provide acceptable voltage and/or frequency.
	Bypass contactor stuck in bypass position.	Symmetra™ is stuck in the bypass position, and cannot go online.	Call your contract service provider, or APC Technical Support at: 1-888-809-TECH

	PowerView Message	Meaning	Corrective Action
Bypass	Bypass contactor stuck in on-line position.	Symmetra™ is stuck in the on-line position, and cannot go to bypass.	Call your contract service provider, or APC technical support at: 1-888-809-TECH
	UPS in bypass due to internal fault.	Symmetra™ has transferred to bypass mode because a fault has occured.	Call your contract service provider, or APC technical support at: 1-888-809-TECH
	UPS in bypass due to overload	The load has exceeded the system power capacity. The Symmetra™ has switched to bypass mode.	**Option #1**: Decrease the load. **Option #2**: If possible, add power modules to the system.
	System is in Maintenance Bypass	The Symmetra™ is in bypass because the maintenance bypass switch is in the "on" position.	No corrective action necessary.
General Fault	On Battery	The Symmetra™ is in the on battery mode of operation. The battery modules are being discharged.	No corrective action necessary. **Note:** Runtime is limited in duration. Prepare to shutdown the Symmetra™ and the load equipment, or restore incoming voltage.
	Need Bat Replacement	One or more battery modules are in need of replacement.	Refer to chapter 8 for module replacement procedures.
	UPS Fault	A fault has occurred in a power module. This will always occur with a bad power module failure message.	Call your contract service provider, or APC technical support at: 1-888-809-TECH
	Shutdown or unable to transfer to Batt due to overload	Symmetra™ has shutdown because an overload has occurred and bypass is not available.	**Option #1**: Reduce the load to eliminate overload. **Option #2**: If possible, add power modules to eliminate overload. **Option #3**: Replace failed power modules to eliminate overload. **Note:** If bypass is not available because of a power failure, wait for power to be restored. If there is a utility problem, get it corrected.
	Load Shutdown from Bypass. Input Freq/Volts outside limits.	Symmetra™ has shut the load down while it was on bypass, because the input power went out of acceptable range.	Correct the input voltage problem.
	Fault, Battery Charger Failure	The battery charger in one or more power module(s) failed.	Refer to chapter8 for module replacement procedures.
	Fault, Bypass Relay Malfunction	The bypass relay has malfunctioned.	Call your contract service provider, or APC technical support at: 1-888-809-TECH

	PowerView Message	Meaning	Corrective Action
General Fault	Fault, Internal Temp exceeded normal limits	The temperature of one or more battery modules is too hot.	Replace the overheated modules. Refer to chapter 8 for module replacement procedures.
	Input circuit breaker tripped open	The input circuit breaker on the Symmetra™ has tripped. Input voltage is disconnected to the Symmetra™.	**Option #1**: If this occurs in conjunction with an overload condition, decrease the load and reset the breaker. **Option #1**: If no overload condition exists, reset breaker. If it trips again, call your contract service provider, or APC technical support at: 1-888-809-TECH
	System level fan failed	A cooling fan in the Symmetra™ frame has failed.	Call your contract service provider, or APC technical support at: 1-888-809-TECH
	The Redundant Intelligence Module is in control	The main intelligence module has failed, and the RIM is functioning as the primary intelligence module.	Replace the intelligence module. Refer to chapter 8 for module replacement procedures.
	IIC inter-module communications failed.	The communications between the MIM and at least one other module has failed.	Call your contract service provider, or APC technical support at: 1-888-809-TECH

Index

A comprehensive index
of all terms and concepts



A

Alarms
- Configuring, 7-5
- PowerView, 6-1
- Threshold status, 7-4

Audible alarm, silencing, 7-5

B

Battery extension connector
- Description, 1-4

Battery modules
- Description, 1-2
- Installation, 5-2
- Ordering replacement, 8-1
- Replacement procedure, 8-2
- Verification, 8-2

BTU output, 2-1

C

Capacity definition (v)

D

Diagnostics screens
- Battery module, 7-6
- Fault & diagnostics, 7-6
- Intelligence module, 7-6
- Power module, 7-6
- Redundant intelligence, 7-6

Dimensions
- Frame, 2-1, 3-1
- Modules, 3-1

E

Electro-static discharge, 2-1
Emergency power off, 4-7

F

Footprint, 2-1
Frame
- Capacity, (v), 5-8
- Description, 1-1, 1-4
- Footprint, 2-1
- Leveling, 5-1
- Pallet, 3-1
- Size, 2-1
- Weight, 2-1

G

Grill covers, 1-2, 5-1
Grounding electrode, 4-6

H

Hot-swappable definiton (v)
Humidity range, 2-1

I

Input wiring, 4-2
Installation checklist, 5-7
Input circuit breaker
- Description, 1-3

L

Log, 7-6
Low battery duration, 7-5

M

Main intelligence module,
- Description, 1-3
- Installation, 5-4
- Ordering information, 8-1
- Replacement procedure, 8-4
- Verification, 8-4

Maintenance bypass switch
- Description, 1-3

Maximum load threshold, 7-5
Minimum run time threshold, 7-5
Modes of operation, (iii)
Module failure alarms, 8-1

N

N+1 definition, (v)

O

Operation modes, i
Operating conditions, 2-1
Output wiring, 4-4

P

Packaging, 3-1
Power distribution unit, 1-4, 4-6
Power off procedure, safety-1
Power module
- Description, 1-2
- Installation, 5-3
- Ordering information, 8-1
- Replacement procedure, 8-3
- Verification, 8-3

Powering the loads, 7-2
Powering the Symmetra™, 7-1
PowerView display
- Description, 1-2, chapter 6
- Installation, 5-5
- LED indicators, 6-2
- Navigation keys, 6-2
- Ordering information, 8-1
- Remote installation, 5-5
- Startup screen, 6-3
- Top level menu, 6-3
- Wall mounting, 5-5

R

Receptacles, 4-6
Redundancy alarm threshold, 7-5
Redundancy definition (v)
Redundant intelligence module
- Description, 1-3
- Installation, 5-4
- Ordering information, 8-1
- Replacement procedure, 8-4
- Verification, 8-4

Replacement modules, 8-1
REPO, 4-7
Return battery capacity, 7-5
Return delay, 7-5
Returning modules to APC, 8-1

S

Self test, 7-4
Shutdown delay, 7-5
Shutdown parameters
- Configuring, 7-5

SmartSlot accessories
- Description, 1-4, 5-6
- Installation, 5-6
- Ordering information, 5-6

Status screens,
- Alarm threshold status screen, 7-4
- Battery status screen, 7-3
- Frequency status screen, 7-3
- Miscellaneous status screen, 7-4
- Percent load status screens, 7-3
- Power status screen, 7-3
- Voltage status screen, 7-2

System Enable Switch
- Description, 1-4

T

Technical support, 8-1
Temperature range, 2-1
Theory of operation, (i)

V

Voltage jumper, 4-2

W

Weights
- Frame, 2-1, 3-1
- Modules, 3-1

Wiring
- Checklist, 4-8
- Grounding electrode, 4-6
- Input, 4-2
- Output, 4-4
- Overview, 4-1
- PDU, 4-6
- REPO, 4-7
- Voltage jumper, 4-2

Wiring Gauge
- Input, 4-2
- Output, 4-4

Toll free technical support:
1-888-809-TECH (8324)

Address:
AMERICAN POWER CONVERSION CORPORATION
132 Fairgrounds Road, P.O. Box 278
West Kingston, Rhode Island 02892
United States of America

Telephone number:
1-401-789-5735

Please note: *Chapter 9 provides solutions for most problems that may occur while operating the Symmetra™ with a PowerView interface.*

Please note: *Before calling technical support, please record the following serial numbers below:*

Frame Serial #: _____

PowerView Serial #: _____

Main Intelligence Module Serial #: _____

Redundant Intelligence Module Serial #: _____

Power Module Serial #'s: _____ (L1)

_____ (L2)

_____ (L3)

_____ (L4)

_____ (L5)

Battery Module Serial #'s: _____ (R2)

_____ (R3)

_____ (R4)

_____ (R5)

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